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EPA 541-R98-010
September 1998

EPA Superfund Record of Decision:

Osborne Landfill
Grove City, PA
12/30/1997

SUPERFUND PROGRAM
RECORD OF DECISION

Osborne Landfill Site

Operable Units, 2, 4 and 5
Mercer County, Pennsylvania

DECEMBER 30, 1997

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PART I - DECLARATION

SITE NAME AND LOCATION

OSBORNE LANDFILL SITE
PINE TOWNSHIP
MERCER COUNTY, PENNSYLVANIA

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) presents the selected remedial action for Operable Unit 2 (wetland sediments), Operable Unit 4 (Clarion Aquifer and Mine Pool) and Operable Unit 5 (Homewood, Connoquenessing and Burgoon Aquifers) at the Osborne Landfill Site in Mercer County, Pennsylvania. The selected remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, (CERCLA), 42 U.S.C. §§ 9601 et. seq.; and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. This decision is based on the Administrative Record for this Site.

The Pennsylvania Department of Environmental Protection (PADEP), acting on behalf of the Commonwealth of Pennsylvania, concurs with the selected remedy.

DESCRIPTION OF THE REMEDY

The Osborne Landfill Site (Site) was created by the disposal of numerous industrial wastes into a closed strip mine. The landfill was closed by the PADEP in 1978. The ground water in the Clarion Aquifer was addressed in the 1990 Record of Decision for the Site, but during the design phase it was shown that the selected Remedial Action could not be implemented as described in the ROD. This ROD addresses all Site ground water and the wetlands to the southwest of the site. The water in the Clarion Aquifer is contaminated above Maximum Contaminant Levels (MCL) allowed under the Safe Drinking Water Act, but contaminant levels are near MCLs, are declining and are expected to reach MCLs within five years from the issuance of this ROD. Residents on the perimeter of the site have access to a public water line. All residents on the perimeter of the site near the contaminant plume have connected to the water line with the exception of the Kring and Parker residences. The ground water in the Homewood, Connoquenessing and Burgoon Aquifers is not contaminated above either health based levels or MCLs. The southwest wetlands have not been significantly impacted by site contaminants.

The selected Remedies for this Site address the long term threats present at the Osborne Landfill Site. The selected Remedies include the following components:

- Natural Attenuation of the Clarion Formation with Continued Ground Water Monitoring

- Periodic Residential Well Sampling

- Continued Monitoring of the Homewood, Connoquenessing and Burgoon Aquifers for Three Years

- No Action for the Southwest Wetland Sediments

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective.

This remedy utilizes permanent solutions and alternative treatment technologies, to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because the selected remedy in the previous ROD for Operable Unit 1 will result in hazardous substances remaining onsite below the ground water table and above health-based levels, a review under Section 121(c) of CERCLA, 42 U.S.C. §9621(c), will be conducted within five years after initiation of the Operable Unit 1 remedy to ensure that the selected remedy is providing protection of human health and the environment.

K. Hodgkiss for 12/30/97

Abraham Ferdas
Acting Director
Hazardous Site Cleanup Division
Region III

Date

RECORD OF DECISION

OSBORNE LANDFILL SITE

PART II - DECISION SUMMARY

I. SITE NAME, LOCATION, AND DESCRIPTION

The Osborne Landfill Site is located in Pine Township, Mercer County, Pennsylvania. Located less than one mile east of Grove City, Pennsylvania. In 1989, the fenced area of the Site encompassed approximately 15 acres along the East Pine Street extension (*see* Figure 1). Strip mining was conducted at the Site during the 1940s prior to disposal of wastes in the strip mine pool. To the north of the Site are woodlands. Farmland is present to the east (above the strip mine highwall) and southeast across the East Pine Street Extension. A large shallow offsite pond is located just west of the Site and is considered to be a federally protected wetland. Another wetland is situated southwest of the Site on both sides of the East Pine Street Extension. The immediate Site area is sparsely populated. Most of the residential homes are located along Enterprise Road, which is approximately 1/4 mile north of the Site, and to the east on Diamond Road. The closest residence is located about 1,000 feet west of the Site. Homes along Enterprise Avenue and Diamond Road previously used ground water, but Cooper Industries extended the municipal water line around the east side of the Site and connected any resident who was willing to accept the connection. Except for Kring and Parker residents, who refuse to use public water, residents along the perimeter of the Site, near the plume, use public water.

The basis for concern at the Site was the presence of approximately 233,000 cubic yards of fill material, which was contaminated with polychlorinated biphenyls (PCBs) (primarily Aroclor 1254), polynuclear aromatic hydrocarbons (PAHs), metals (lead and chromium), and several volatile organic compounds (VOCs). The contents of the fill mainly consisted of spent foundry sand from Cooper Industries, one of the potentially responsible parties (PRPs) associated with the Site. Solid waste and manufacturing refuse are also present on the surface of the Site and within the fill material. Fill material was deposited into the strip pool at the base of the highwall from the late 1950s to 1978, when the Site was closed by PADEP[1] for not having a permit to accept wastes. Dumping of foundry sand and other wastes into the mine pool eventually created three separate onsite leachate ponds. Materials disposed at the Site include spent sand; infilco sludge (settled sludge collected from hydroblast equipment); spent carbide (a byproduct consisting of a lime and water slurry); waste acids from plating and cleaning tanks; spent Sunoco spirits and solvents. Miscellaneous debris including scrap steel, wood, and metal chips were also taken to the former disposal area.

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[1] This agency was known as the Pennsylvania Department of Environmental Resources (PADER) prior to July 1995.

FIGURE 1

REFERENCE: U.S.G.S. 7.5' TOPOGRAPHIC MAP GROVE CITY QUADRANGLE PENNSYLVANIA, DATED: 1961, PHOTOREVISED: 1981, SCALE: 1"=2000'.

Civil & Environmental Consultants, Inc. Foster Plaza XI • 780 Holiday Drive • Pittsburgh, Pennsylvania 15220 (412) 921-3402 • (800) 365-2324 • Fax (412) 921-1818			SITE LOCATION OSBORNE LANDFILL SITE OPERABLE UNIT NO.4 REMEDIAL DESIGN ALTERNATIVES ANALYSIS	
DWN. BY: S.METZ	APPROVED BY:	SCALE: 1"=2000'	DATE:	FIGURE 2-1
CHKD. BY:				

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II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Site was investigated by the EPA and the PADEP following its closure as a non-permitted landfill. In 1982, the Site was placed on the National Priorities List (NPL). Various activities were conducted between 1982 and 1989 by either the PADEP, EPA or Cooper Industries; they are listed below in chronological order:

- 1983 - Installation of a security fence around the Site and the removal of over 600 drums and 45 cubic yards of soil by Cooper Industries.

- 1983 - Cooper Industries conducted a Remedial Investigation at the Site, in accordance with a Consent Order and Agreement between Cooper Industries and the PADEP.

- 1985 - EPA conducted an investigation of the disposal area to determine the contaminants in the waste.

- 1988/1989 - EPA conducted a second Remedial Investigation to assess the nature and extent of contamination in all media (ground water, surface water, waste and soil/sediments). A Feasibility Study was conducted which identified alternatives for remediating the Site.

Based on the data obtained from the above investigations and reports, the EPA issued a Record of Decision (ROD) in 1990 which addressed contamination in the fill, the leachate associated with the fill and the Clarion Aquifer. The Record of Decision deferred making a decision on the wetlands to the southwest of the Site, and the Homewood, Connoquenessing and Burgoon Aquifers until additional studies were performed. The 1990 Record of Decision required installation of a slurry wall around the perimeter of the fill area, placement of a clay cap over the surface of the fill area, and installation of a leachate extraction, treatment and reinjection system. The treated leachate is injected into the mine voids to the east of the site. The option to reinject the treated water was influenced by community concerns that removal of water from the formation could cause subsidence and damage to nearby homes. The remedy for the fill area has been constructed and is operational.

The 1990 Record of Decision also selected ground water wells and treatment by air stripping as the remedial action for the Clarion Aquifer which is the shallowest drinking water aquifer at the Site. During the design, and after several aquifer pump tests, EPA determined that remediation of the Clarion Aquifer as required by the 1990 Record of Decision was not possible. The Clarion aquifer is a thin layer of sandstone above either a coal/clay layer or mine voids. The mine voids have produced substantial roof fracturing of the sandstone. Because the aquifer is so thin and fractured, pumping wells placed in the Clarion formation draw small diameter columns of water which come primarily from the mine pool, instead of the typically wider capture zone. To provide overlapping capture zones in the Clarion Aquifer, an extremely large number of wells would be needed. Consequently, the number wells needed to remediate the aquifer would be an order of magnitude or more than the description of the pump and treat system in the 1989

Feasibility Study. Additionally water in the mine pool is more contaminated than the Clarion Aquifer and pumping wells would draw higher levels of contamination into the Clarion Aquifer. At EPA's request, Cooper Industries produced a report titled: Alternatives Analysis and dated April 28, 1993. This Alternatives Analysis report detailed the results of the pump tests and the data analysis. The report also identified potential alternatives to EPA's previously selected cleanup approach. Since additional ground water studies were required for the deep aquifers and the Homewood Aquifer, EPA made a decision to delay the remedial action until all of the ground water studies were completed and the interaction between the aquifers was better understood. EPA would then issue a final decision for all Site ground water.

During the Remedial Investigation conducted in 1988 and 1989, the wetlands to the southwest of the Site were investigated. Sampling and analysis of wetland sediments revealed only very low levels of contaminants, which would not have required remedial action. However, some biological toxicity tests on fathead minnows and daphnia gave inconsistent results and needed to be repeated. Additionally, very low levels of PCBs were found in the sediments. EPA was concerned about potential bioaccumulation of PCBs in aquatic organisms and required additional sediment sampling and testing to make a final decision. The 1990 Record of Decision deferred a decision on these sediments to a later ROD.

EPA entered into a Consent Order and Agreement with Cooper Industries on October 10, 1992, which required Cooper Industries to conduct a Focused Remedial Investigation, Feasibility Study and Risk Assessment limited to the wetland sediments southwest of the Site and ground water in the Homewood, Connoquenessing and Burgoon Aquifers. During the Remedial Investigation, Cooper Industries extended a public water supply water line along Enterprise Road and Diamond Road in June 1994 to allow residents potentially affected by contaminated ground water in individual wells east and north of the site to use public water. The water line was extended in response to the detection of concentrations above the MCL of vinyl chloride in the well at the Eickmann property east of the Site. Cooper Industries completed the Remedial Investigation and EPA approved the final Focused Remedial Investigation Report on January 26, 1996. Cooper Industries completed the Focused Feasibility Study, which EPA approved on September 27, 1996.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The documents which EPA used to develop, evaluate, and select a remedial alternative for the Site have been maintained at the Grove City Community Library, 125 West Main Street, Grove City, PA 16127 and at the EPA Region 3 Office, located at 841 Chestnut Street, Philadelphia PA 19107.

The Remedial Investigation/Feasibility Study (RI/FS) and Proposed Plan for the Osborne Landfill Site were released to the public on August 6, 1997. The notice of availability for these documents was published in the Sharon Herald and the Allied News on August 6, 1997. An additional notice of the public meeting was published in the Sharon Herald on August 22, 1997 and in the Allied News on August 20, 1997. A 30-day public comment period began on August

6, 1997 and concluded on September 5, 1997.

A briefing for the Board of County Supervisors, and a public meeting were held during the public comment period on August 25, 1997. At the public meeting, representatives from EPA answered questions about the Site and the remedial alternatives under consideration. Approximately 25 people attended the meeting, including residents from the impacted area, local government officials, and news media representatives. EPA subsequently received several requests to extend the public comment period. EPA published a notice of extension of the public comment period in the Sharon Herald and Allied News on September 10, 1997, extending the comment period until October 10, 1997.

Comments received during the public meeting strongly supported much more extensive residential well sampling on all sides of the landfill for a longer timeframe than EPA believes justified. Some comments received also supported substantial additional investigation of site ground water prior to issuing a Record of Decision for ground water and were critical of EPA's past remedial investigation work..

IV. SCOPE AND ROLE OF THE RESPONSE ACTION

As with many Superfund sites, the problems at the Osborne Landfill Site are complex. Therefore, the cleanup has been addressed in several phases or Operable Units (OUs). The Osborne Landfill Site has been divided by EPA into the following five operable units:

OU-1: Fill material in strip pit
OU-2: Wetland Sediments
OU-3: Leachate
OU-4: Ground Water in the Clarion Formation
OU-5: Ground Water in the Homewood, Connoquenessing, and Burgoon Formations

EPA selected the following remedies for OU-1, OU-3 and OU-4 in a Record of Decision issued in September 1990: installation of a slurry wall and a clay cap to contain the contaminants in the fill material (OU-1); installation of an extraction, treatment, and reinjection system to address the leachate (OU-3); and extraction of ground water in the Clarion Formation (OU-4) and treatment by air stripping. The measures to address the fill material and the leachate have been constructed and are operational at the Site. The OU-4 ground water component is being revised as part of this ROD. The primary objective of this Record of Decision is to describe what is needed to reduce or eliminate potential risks to human health or the environment from exposure to contaminants associated with wetland sediments (OU-2) and all ground water (OU-4 & OU-5) at the Site. EPA's selected cleanup alternatives address the risk posed by the release or threat of release of hazardous substances from these operable units. This is the final Record of Decision for this Site.

V. SUMMARY OF SITE CHARACTERISTICS

A. Surface Features

Pre-Remediation

The Site includes an abandoned strip mine and associated area that is approximately 15 acres in area (including the mine spoil piles and highwall areas). The strip pit filled with water from surface water runoff and ground water, forming a small lake. Waste was deposited in the pit at the southern end until all of the pit was filled except for three onsite leachate ponds. The disposal area was between the spoil piles and the highwall of the pit on the eastern side. Leaking drums were stored on the highwall and were removed in 1983. The spoil piles and the highwall became overgrown with trees and shrubs. The actual disposal area was estimated at 6 acres.

The Site is bordered to the west and the south by a flat low lying wetlands area. Between the wetland and the actual disposal area are the strip-mine spoil piles. The Pine Street extension passes by the southeastern portion of the Site. Agricultural fields are present to the east of the Site, and across the Pine Street extension. The northern border of the Site consists of woods and then single homes along Diamond Road.

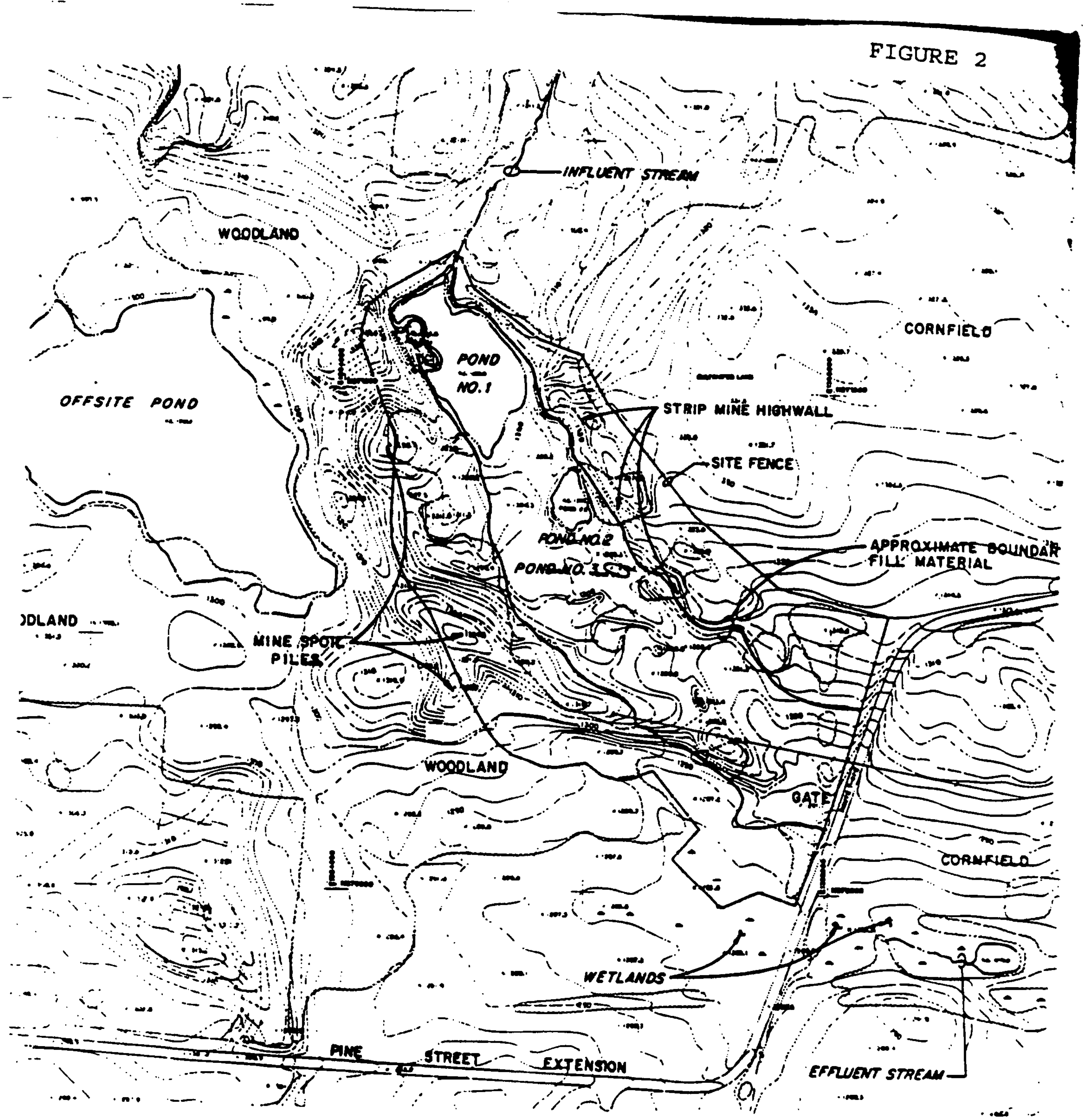
The three onsite leachate ponds were located below the highwall. Numerous drum carcasses were present along the banks of the onsite leachate ponds and within the leachate ponds. The surface of the fill was littered with slag, foundry sand boulders, manufacturing debris (wire, scrap metal, machinery etc.), stoves, refrigerator parts, plastic, empty cans and drums, etc.

As discussed previously, a wetland is situated along the western border of the Site, at the southern end of the site. A large offsite pond, estimated to be approximately 3 acres in size is located at the northern portion of the wetlands. An intermittent stream drained into leachate pond #1 onsite (*see attached figure 2*). A small stream drains the wetlands and runs through a culvert under the Pine Street extension.

Current Conditions

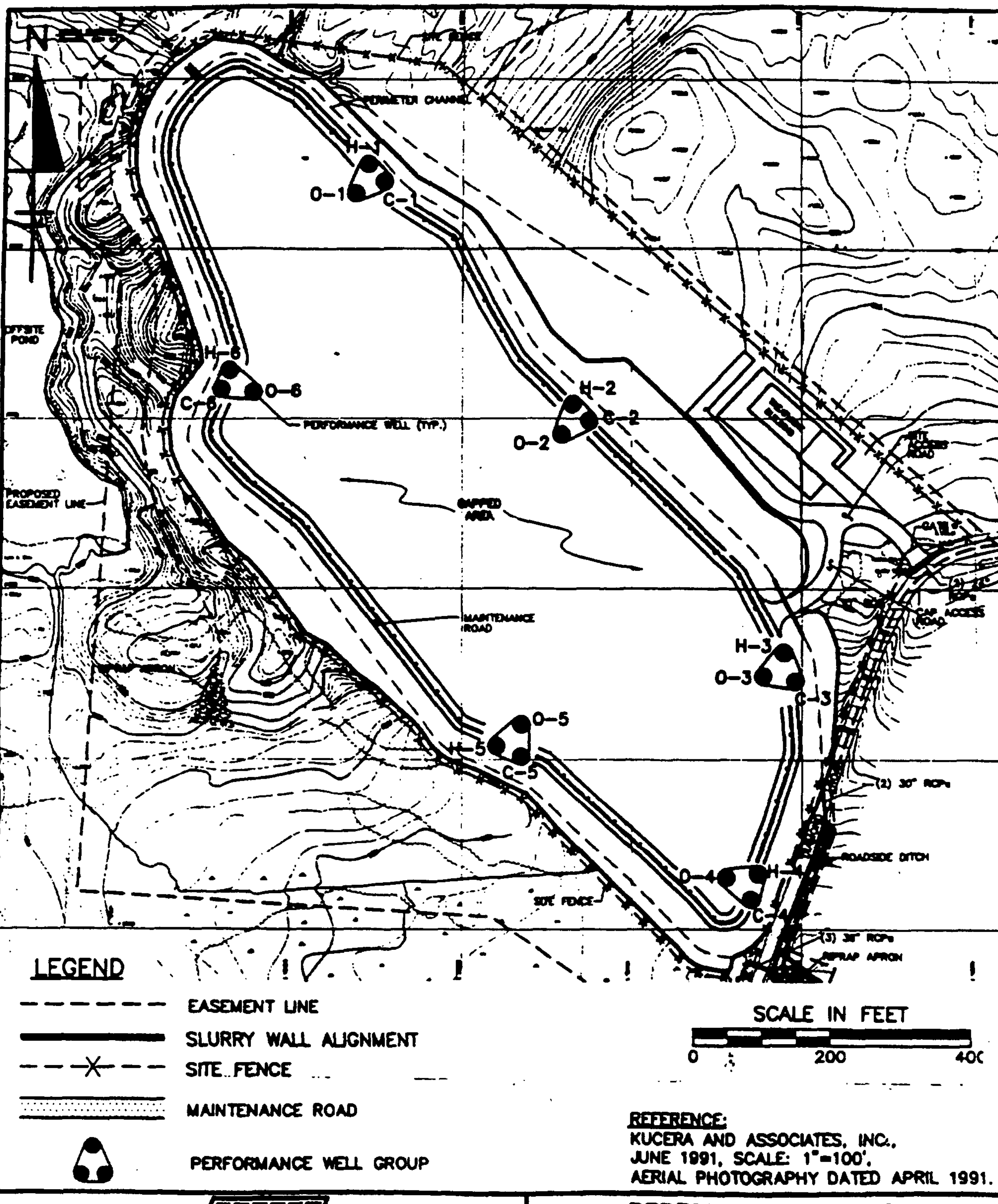
The construction of the Remedial Action for the fill area was completed during the Summer of 1997. The Site was graded, leachate ponds filled in, a slurry wall installed around the perimeter of the Site, and a geo-composite impermeable cap and soil cover were completed (*see figure 3)*. An artificial wetlands was constructed to expand the wetlands to west of the Site to replace wetlands damaged by the installation of the cap. The stream which previously drained into pond #1 was routed around the landfill and empties into the artificial wetlands. A leachate treatment system consisting of manganese/iron removal with green sand, air stripping and carbon adsorption is operational. The leachate treatment removes contaminants to below safe drinking water levels and the treated water is injected into the mine pool to the east of the Site. Storm water runoff from the landfill cap is collected by drainage channels and flows into the stream

FIGURE 2



GENERAL ARRANGEMENT OF THE SITE AREA
OSBORNE LANDFILL SITE, GROVE CITY, PA

FIGURE 3



REFERENCE:
KUCERA AND ASSOCIATES, INC.,
JUNE 1991, SCALE: 1"=100',
AERIAL PHOTOGRAPHY DATED APRIL 1991.

CEC Civil & Environmental Consultants, Inc. Pittsburgh, PA (412) 921-3402 • (800) 365-2324 Cincinnati, OH (513) 985-0226 • (800) 759-5614	PERFORMANCE WELLS OSBORNE LANDFILL SITE OPERABLE UNIT NO. 1 PINE TOWNSHIP, PENNSYLVANIA

DWN. BY: S.M.M. CHKD. BY:	ACAD FILE: FIGURE1-2	SCALE: 1"=200'	DATE: 6/25/97	97135	FIGURE 1-2

G:\PROJECTS\97135\DWG\FIGURE1-2.DWG (S. METZ) - JUN 26, 1997 - 09:07:21

across the East Pine Street extension. The Site is surrounded be a chain link fence to prevent public access.

B. Geology

Grove City is located in the glaciated portion of the Allegheny Plateau physiographic province. Geology beneath the Site includes flat-lying Mississippian- and Pennsylvanian-age sandstones and shales (*see note on figure 4*). The Mississippian-age Burgoon Formation is the lowest geologic unit evaluated at the Site. This unit lies approximately 190 feet below the surface and consists of an upper shaley member and an underlying massive, medium-grained, sometimes fossiliferous sandstone.

The Pennsylvanian-age Connoquenessing Formation unconformably overlies (separated by a period of non-deposition) the Burgoon Formation. It generally includes upper and lower sandstone units separated by a unit of interbedded sandy shale, coal, and siltstone. Onsite wells indicate the formation has a total thickness of 20 to 75 feet. The lower sandstone is fine- to medium-grained while the upper sandstone is fine-grained to silty. The intervening shaley unit is sometimes missing.

The Mercer Shale is present onsite as a black shaley to sandy siltstone 15 to 40 feet thick. The thin interbedded limestone lenses regionally found within this unit were not noted in logs of onsite wells.

The Homewood Formation is a micaceous fine- to coarse-grained, generally massive sandstone, 50 to 75 feet thick. The sandstone exhibits a sucrosic texture and is sometimes thinly interbedded with shale. The sandstone unit is overlain by zero to 15 feet of siltstone and shale.

The Clarion Formation is the uppermost continuous bedrock unit beneath the Site and vicinity. It is characterized by interbedded sandstone, shale, and coal units. The lowermost unit of the Clarion Formation is the Brookville Coal, which is generally several feet thick and is economically minable. The associated underclay is up to 9 feet thick beneath the Site. The coal was strip mined at the Site and deep mined in adjacent areas. Overlying the Brookville Coal is a 20- to 50-foot thick series of sandstone and sandy shale, referred to herein as the Clarion Sandstone. The Clarion Sandstone is absent west of the Site, and was removed from most of the Site by strip mining activities. In deep mined areas immediately east of the strip mined area, the unit is up to 40 feet thick. It has been identified as a fine to medium-grained micaceous sandstone with thin interbedded layers of siltstone. Well logs from site investigations indicate that deep mining activities have resulted in fracturing of lower portions of the Clarion Sandstone. The Scrubgrass Coal occurs near the top of the formation. This unit is generally less than one foot thick and is not economically minable.

The Vanport Limestone - a regional marker bed within the Clarion - is found locally in isolated patches. The unit was encountered in only one well, MW-9, during site investigations with a thickness of 3.5 feet. The material encountered was a hard, gray, crystalline, dolomitic limestone which became fossiliferous near the base of the unit.

C. Hydrology

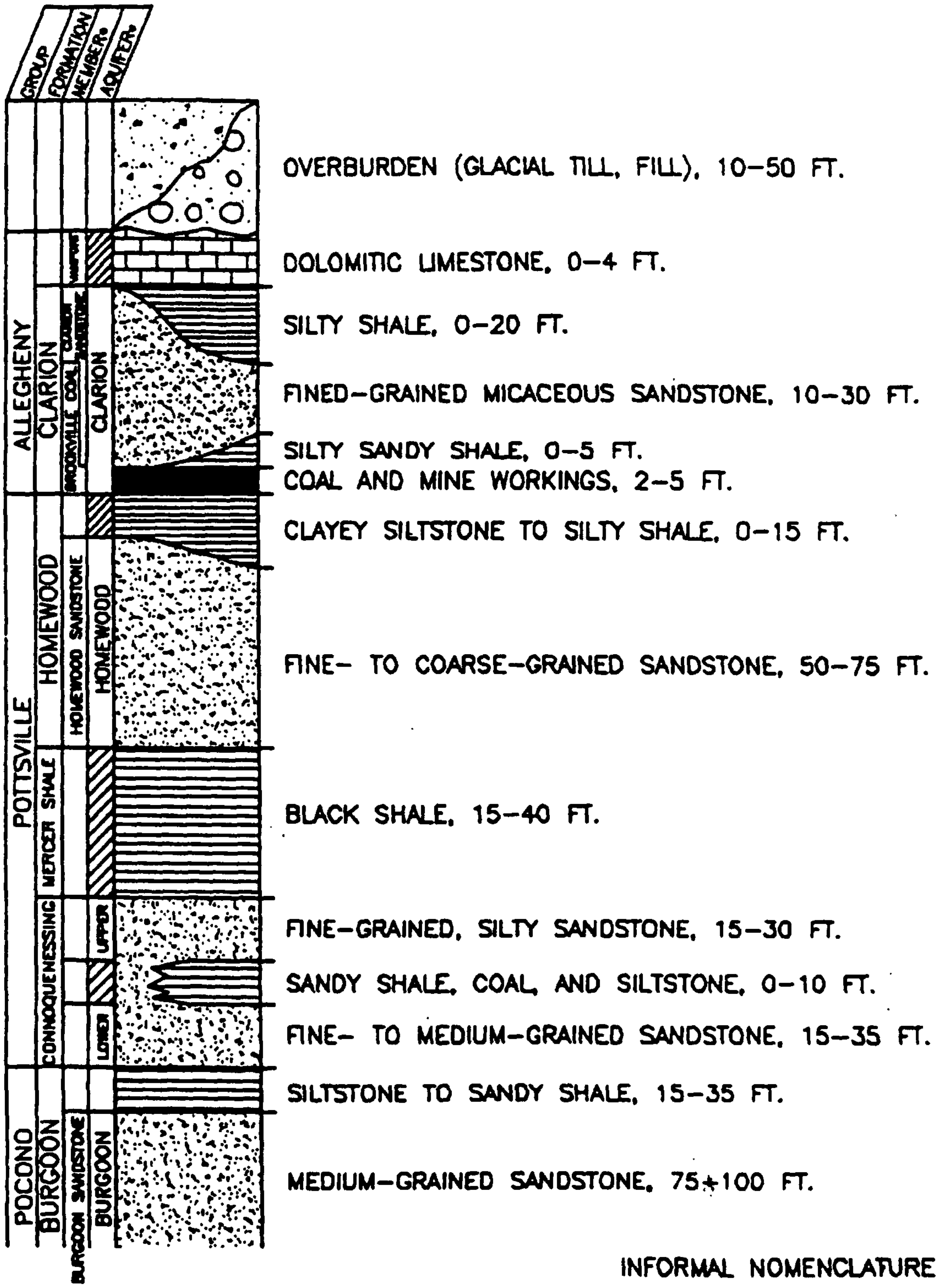
The aquifers beneath the Site, exclusive of unconsolidated materials, are the lower sandstone and coal of the Clarion Formation, the Homewood Sandstone, the upper and lower Connoquenessing Sandstone, and the Burgoon Sandstone (*See figure 5*). The Clarion is the uppermost aquifer and is separated from the Homewood Sandstone Aquifer by the Brookville underclay and other siltstones. These fine-grained strata form a thick and generally continuous restriction to ground water movement referred to as an aquitard.

The Brookville Coal and Clarion Sandstone belong to the same aquifer, as no substantial aquitard separates these two permeable units. Although a shale is sometimes present over the coal, the stratum is thin and discontinuous, and has been intensely fractured by mining activities. Hydraulic interaction with the overlying sandstone is complex. Differences in hydraulic head between the two units produces vertical hydraulic gradients which likely vary from upward in some areas to downward in others and may also vary with time. Roof fracturing of mine rooms increases the permeability of the lower portion of the sandstone which increases the magnitude of flow between the two units.

For the purpose of this ROD, the ground water units adjacent to the site have been divided into two groups. The Clarion Aquifer and mine void system will be treated as a single unit for the reasons described in the preceding paragraph. The Homewood, Connoquenessing, and Burgoon Aquifers will be treated as a single unit since they underlie the base of the landfill that is the source of the ground water contamination.

Ground water flow direction in the overburden aquifer (mine spoil, glacial drift deposits and onsite fill materials) is given in figures 3-9 and 3-10 of the 1989 Remedial Investigation Report. Ground water flow direction in the Clarion Formation/Mine Void system is towards the southeast as shown in figure 3-11 of the 1989 RI Report. Prior to installation of the slurry wall and cap system, ground water flow direction in the Homewood Aquifer appeared to be influenced by the onsite leachate ponds, which may recharge the Homewood Aquifer near the site. The installation of the slurry wall and clay cap have removed this source of recharge and has eliminated this influence. Figures 3-12, 3-13 and 3-14 show the ground water flow directions that were interpreted in the 1989 report by EPA's contractor (NUS). The ground water flow directions in the Burgoon and Connoquenessing Aquifers are shown in figures 3-17 through 3-20. In contrast to the shallow aquifers which flow to the southeast, the Burgoon and Connoquenessing Aquifers flow to the northwest. EPA believes that this is at least partially caused by the influence of the municipal wells which are to the northwest of the Site. The Mercer Shale aquitard separates the deep aquifers from the shallow aquifers and substantially restricts vertical ground water movement between the formations, but was not present on-site. For the readers convenience, the figures discussed above are included as appendix A.

FIGURE 4



* INFORMAL NOMENCLATURE

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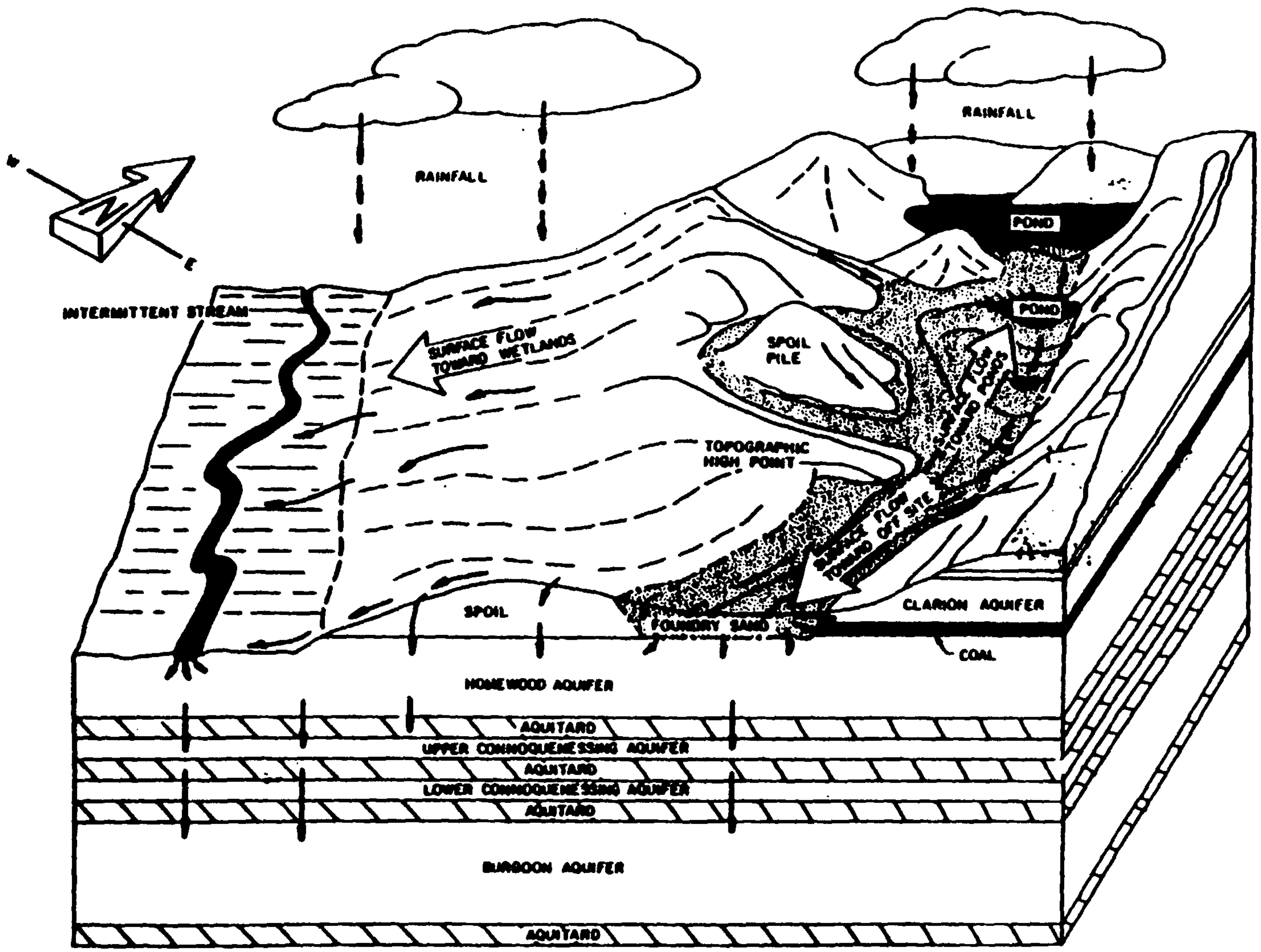
STRATIGRAPHIC COLUMN
OSBORNE LANDFILL SITE
OPERABLE UNIT NO.4 REMEDIAL DESIGN
ALTERNATIVES ANALYSIS

DWN. BY: S.METZ	APPROVED BY:	SCALE:	DATE:		
CHKD. BY:		N.T.S.	4/5/93	91187	FIGURE 2-2



CONCEPTUAL MODEL
OSBORNE LANDFILL SITE, MERCER COUNTY, PA

FIGURE 5

302210

VI. NATURE AND EXTENT OF CONTAMINATION

The primary objective of the Remedial Investigation was to characterize the nature and extent of hazardous substances present at the Osborne Landfill Site. As a part of this effort, the Remedial Investigation Report dated December 29, 1995 (RI) identified and evaluated Site-related contaminants, their potential migration routes, and exposure pathways for human and ecological receptors.

A. Clarion Formation

Monitoring Wells: Seven monitoring wells were installed in the Brookville Coal mine void and five monitoring wells were installed in the Clarion Aquifer during the Remedial Investigations performed in the 1980s. Several organic compounds were detected at low concentrations in the mine void near the Site. These organic compounds included toluene, vinyl chloride, cis-1,2-dichloroethene, trans-1,2-dichloroethene, trichloroethene (TCE), 1,1-dichloroethene, 1,1-dichloroethane, and 1,1,1-trichloroethane. Vinyl chloride was detected in mine void wells at concentrations as high as 47 micrograms per liter (µg/l) near the highwall area in one well sampled in 1989. Vinyl chloride was only detected in one Clarion Aquifer monitoring well at a concentration of 6 µg/l during the 1989 Remedial Investigation. Contamination in the Clarion Aquifer was limited to the area above the highwall of the landfill.

In 1992 and 1993, further investigations were performed to support the design of the system to extract and treat ground water from the Clarion Aquifer (OU-4).. These investigations included installation of additional monitoring wells, the sampling of new and existing wells, and performing a pump test of the Clarion Aquifer. Samples from the mine void and Clarion Aquifer monitoring wells were analyzed for VOCs. Vinyl chloride was not detected in any of the Clarion monitoring wells during the 1995 sampling event. Vinyl chloride was only present in four of the mine void monitoring wells at concentrations ranging from 2 to 5 µg/l, however, vinyl chloride was present in the Eickmann residential well at up to 16 µg/l in the same formation.

The ground water of the mine void system is contaminated with vinyl chloride above the Safe Drinking Water Act Maximum Contaminant Limits (MCLs). The MCL for vinyl chloride is 2 ppb. The presence of vinyl chloride in the mine voids appears to extend just east of monitoring wells MWV-3, MWV-4 and MWV-5, located from 700 to 1,200 feet from the landfill. The exception to this extent of vinyl chloride contamination appears to be the Eickmann residential well, which is completed in the mine voids and located about 1,700 feet from the landfill. The higher levels of vinyl chloride detected in the Eickmann well may be due to a preferential pathway in the mine voids or some other local source. Although the concentrations in the Eickmann well have fluctuated during sampling, concentrations over time are decreasing. The current average concentration appears to be about 4 to 6 ppb based on a regression of all data obtained through September 1997. Vinyl chloride was not detected in any of the other sixteen residential wells completed in the Clarion Aquifer or mine voids. The results from recent ground water sampling events are shown on Drawing 95414.18-M1 in the Feasibility Study (see AR306172). This drawing shows both the extent of vinyl chloride contamination and the concentrations through time.

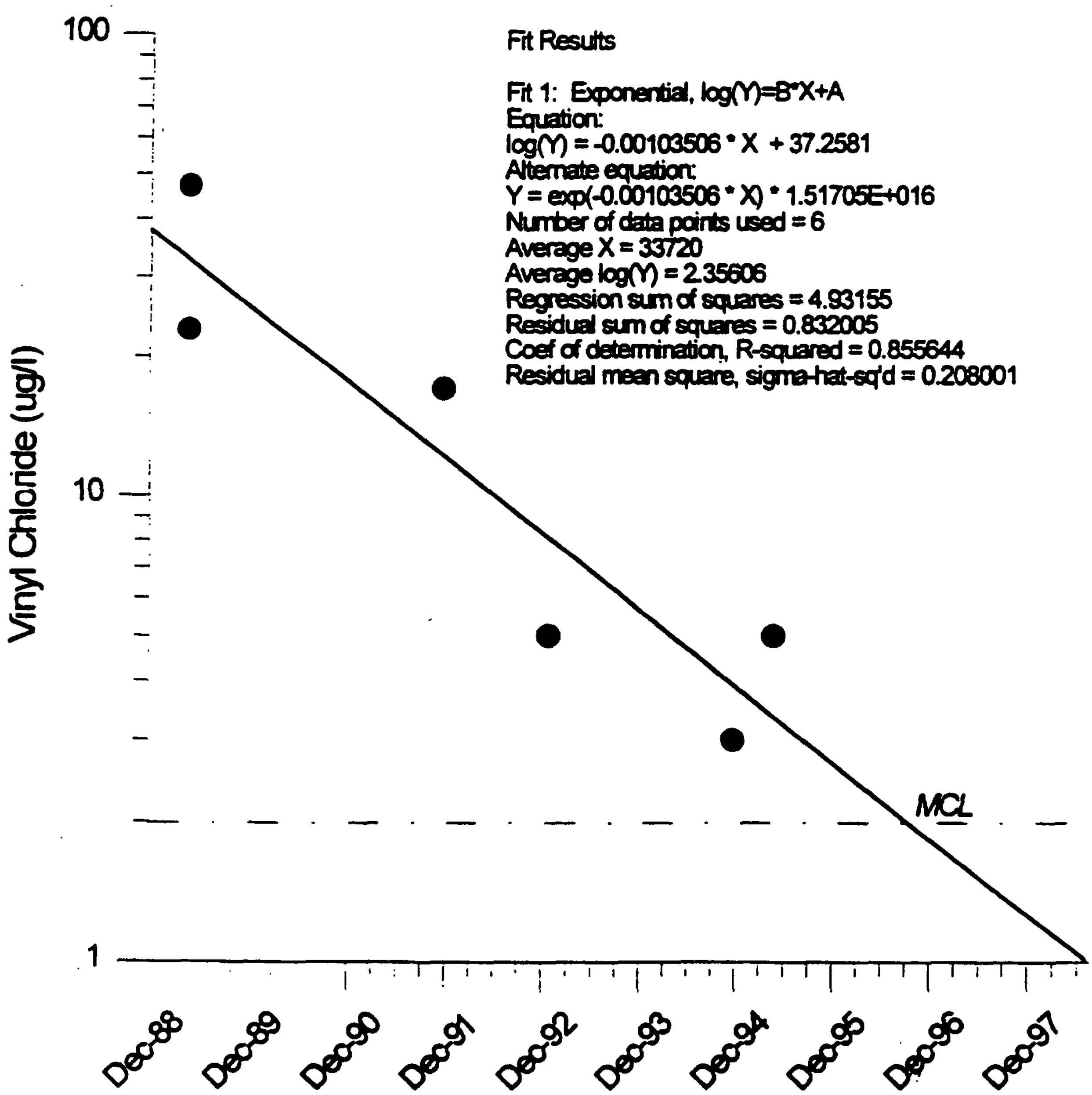
Recent monitoring has indicated that the vinyl chloride concentrations in the Clarion Aquifer have decreased to below laboratory detection limits and concentrations of vinyl chloride in the mine void have also decreased from previous high levels. The vinyl chloride concentration in monitoring well MWV-2, which has historically been the highest, has decreased from 47 µg/l in 1989 to 5 µg/l in 1995 (See Figure 6). While individual wells samples have shown some varying trends over time, the overall trend of vinyl chloride in the mine void is downward.

The piezometric surface of the Clarion Aquifer , east of the Site, at the time of the Alternatives Analysis (1993) indicated ground water flow to the southwest and towards the landfill with a fairly uniform hydraulic gradient of approximately 0.02 ft/ft. The topography in figure 1 also slopes towards the landfill in this area. The topography and ground water direction then turn toward the southeast at the southern end of the landfill. The gradient on the piezometric surface on the mine void is very low, varying from 0.0008 ft/ft (1993 Alternatives Analysis) to 0.001 ft/ft. Water levels obtained in May 1995 for the RI showed the ground water in the mine voids moving northeast and southwest from a potentiometric ridge about 1,000 feet northeast of the landfill, which acts as a ground water divide. A relatively small change in head, however, could override the ground water divide, allowing ground water to move eastward from the landfill. Following precipitation events, the water level in the onsite leachate ponds (which are in contact with the coal) have been observed to rise by as much as 10 feet. This ponding of water could reverse the ground water flow direction and could cause water to flow across the ground water divide towards the Eickmann residential well. The OU1 remedial action which has been implemented at the landfill will prevent this occurrence in the future.

Generally, the principal method of contaminant transport is advection along the direction of ground water flow, with lateral dispersion playing a secondary role. Ground water flow has both horizontal and vertical components. Therefore, vertical hydraulic gradient provides the impetus for vertical contaminant transport. In the case of the landfill, contaminants could migrate from the more highly contaminated mine void into the lesser contaminated Clarion Sandstone in areas where an upward hydraulic gradient exists.

Rates of attenuation were evaluated by time-trend analysis to project vinyl chloride concentrations through time. Historic concentrations at each well were assessed using exponential least-squares regression analysis with time as the explanatory variable and concentration as the response variable. The results of this analysis are included in Appendix B of the Feasibility Study and suggest MCLs will be achieved by attenuation in one to three years. Because this analysis is not precise, MCLs are projected to be achieved in three to five years. As stated previously, quarterly sampling results obtained in 1997 from the Eickmann well confirm a decline of vinyl chloride as predicted in the Feasibility Study.

The mine voids create open subsurface pathways for the movement of contaminated water. The ground water flow direction in the mine may fluctuate as the pond level increases.



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Vinyl Chloride Concentrations through Time for MW-2

This fluctuating ground water flow direction can move contaminated ground water to and away from the wells, resulting in fluctuating vinyl chloride concentrations.

The pump test conducted during the remedial design indicated that the complex fracturing of the Clarion Formation and its hydrologic association with the underlying mine voids/pool makes extraction and treatment of this ground water problematic. The Clarion Aquifer is so thin and fractured that extraction wells simply draw a column of water from the mine pool below the formation, introducing more contaminated water in the Clarion Formation, which is used for drinking water. Additionally, the width of the capture zone during the pump test was so small (less than 1 meter in diameter) that an extremely large number of wells would be needed to capture the contaminant plume in the Clarion Formation. Also, the extraction wells would draw contaminated mine water above MCLs into the Clarion Aquifer which is currently below MCLs.

One remarkable aspect of the Osborne Landfill Site is virtual absence of the compounds that that EPA usually finds as "companion" contaminants with vinyl chloride. Vinyl chloride boils at 7degrees Farenheit, is a gas at room temperature and is generally only used in the plastics industry. All vinyl chloride is manmade or results from the breakdown of other manmade substances, such as trichloroethylene, trichloroethane, and tetrachloroethylene. Most of the vinyl chloride produced in the United States is used to make polyvinyl chloride (PVC). Vinyl Chloride was not disposed of at the Osborne Landfill. One of the most common ground water problems at Superfund Sites is related to trichloroethylene (TCE) solvent disposal. TCE (a degreaser for metals) when disposed in the 1970's or early 1980s, can often still be found at levels of thousands of parts per billion in ground water. The breakdown products dichloroethylenes (DCE) are often found at much lower levels and vinyl chloride (VC) at even lower levels. DCE and Vinyl Chloride are formed by sequential removal of a chlorine atom from the TCE molecule. The solvent TCE forms a non-aqueous phase which dissolves very slowly into the ground water and can then degrade to the more harmful chemicals dichloroethylene and vinyl chloride. Vinyl chloride finally degrades to harmless ethylene gas. Aquifers contaminated with large amounts of TCE are very difficult to cleanup, because the TCE generally takes decades to completely dissolve into the ground water and the dissolved TCE becomes a persistent source of DCE and VC. In contrast, it appears that virtually all of the TCE disposed at the Osborne Site has quickly been degraded to vinyl chloride.

TCE can be degraded to DCE and VC by several well understood mechanisms. Bacteria in the subsurface can degrade chlorinated compounds, especially when another energy source (food) is present to promote bacteria populations. In the fill area, prior to remediation, soils were generally very dark and were described as oily by EPA's contractors. This was due to the past disposal practices of cutting oils and other oily wastes. This may have promoted bacteria growth in the subsurface and may have contributed to TCE degradation to VC. The wastes from Cooper Industries were derived from foundry operations. Substantial quantities of iron and steel trash were disposed of into the landfill. Steel drum carcasses covered the bottom of the onsite leachate ponds. Researchers at the University of Waterloo discovered that TCE in ground water will degrade sequentially to DCE, VC and finally ethylene gas in the presence of iron. Iron filings derived from ground up cars have been used to destroy TCE in a remedial action technology know as reactive walls. The iron filings are placed in a trench and when TCE contaminated ground water flows through the iron filings, the TCE, DCE and VC are destroyed. The large amounts of iron and steel disposed into the landfill may have reacted with TCE disposed at the site. Regardless of the mechanism which degraded the TCE and produced VC at the Osborne Site, it is clear that substantial degradation occurred, and all that is left is the breakdown product from the original solvent contamination . EPA expects this process to continue and in conjunction with dilution and dispersion to reduce vinyl chloride to the MCL of 2 ppb within several years.

Residential Wells Seven residential wells were sampled quarterly from September 1993 through September 1994, and analyzed for low level TCL VOCs. Vinyl chloride was the only VOC detected above risk based screening levels, and it was detected only in the Eickmann well at concentrations varying from less than 1 to 16 µg/l. The residential well locations, along with vinyl chloride concentrations detected over time, are shown on Drawing 95414.18-M1 of the Feasibility Study (see AR 306172). During the initial sampling event, the residents were all questioned regarding the depth of their wells. The reported depths are summarized below:

Table 1 - Residential Well Depths

Resident	Depth of Well (ft)	Resident	Depth of Well (ft)
Breese	75	Kring	48
Eickmann	60	Donnelly	--
Dunn	50	Dinniger	72
Lazor	48		

The Eickman well was the only well which showed contamination at levels of potential concern. The results of this well sampling through time are shown below

Table 2 - Eickman Well Concentrations

Date	Vinyl Chloride Concentration, µg/l
Sept. 93	16
Feb. 94	14
May 94	4
Sept 94	6
May 95	11
Feb. 97	10
May 97	1, 1 (duplicate sample)
Aug 97	1, 10 (duplicate sample)
Sept 97	4, 9 (duplicate sample)
Sept 97 (late)	9, 4 (duplicate sample)

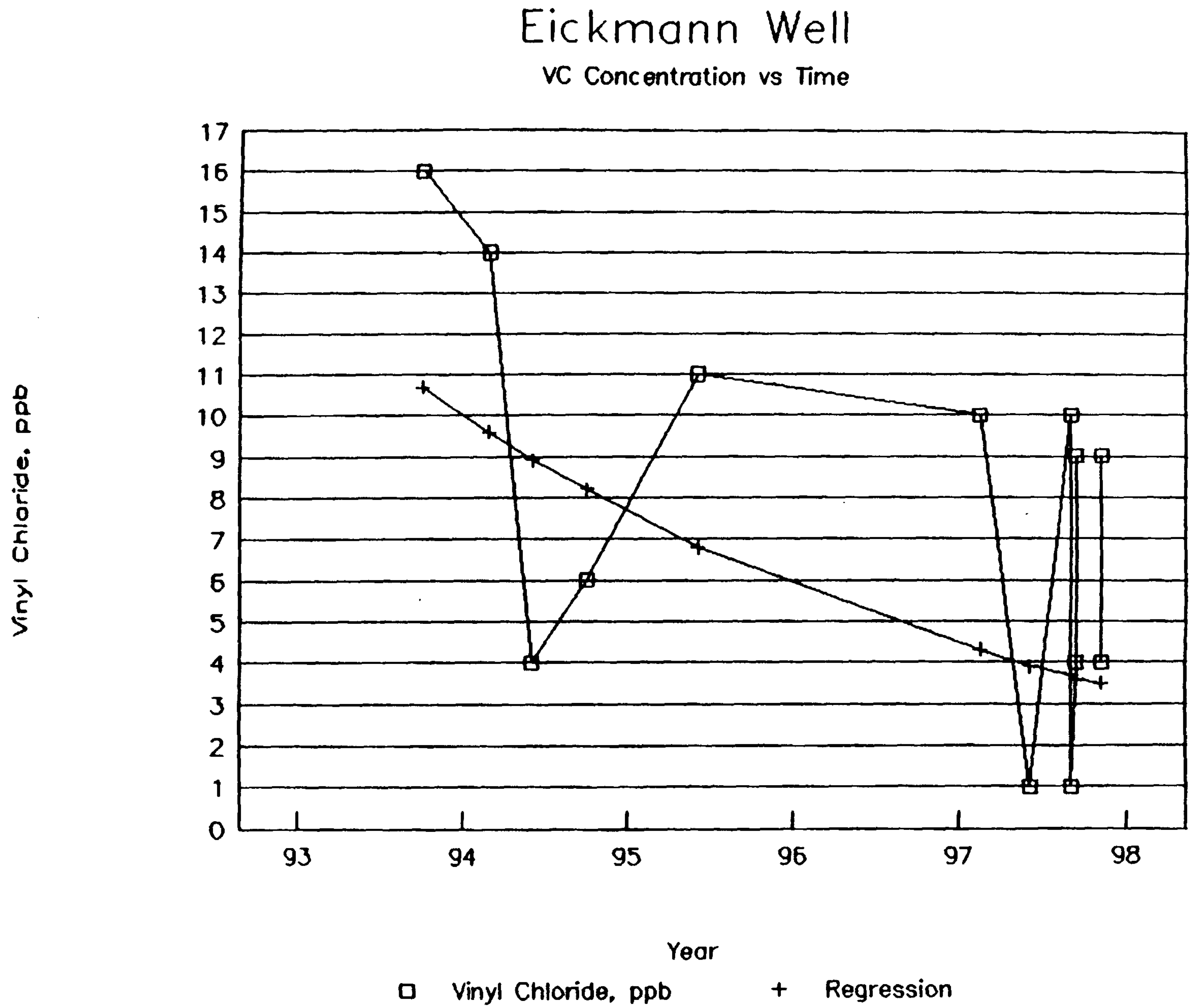

Eickmann Well
VC Concentration vs Time
Vinyl Chloride, ppb
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
93
94
95
96
97
98
Year
Vinyl Chloride, ppb
Regression

FIGURE 7

Based on the reported depths of the wells and estimated depth of the Brookville coal seam at each location, the residential wells appear to be completed in the Clarion Aquifer or underlying Brookville coal seam. A new well was drilled at the Eickmann residence in an attempt to locate an alternate water supply. The top of the coal seam was encountered at a depth of 56 feet, which would indicate the Eickmann well is screened in the coal seam. Because the residential wells are completed in the Clarion Aquifer and mine void system, they will be addressed as part of this aquifer.

B. Homewood Aquifer

Investigations conducted during the 1980s detected low concentrations of VOCs in water samples from the Homewood monitoring wells within the fenced landfill area. Contaminants include trichloroethene (5.7 μg/l maximum) and vinyl chloride (1.1 μg/l maximum). No inorganics were detected in these wells. No VOCs or inorganics were detected in water samples from the Homewood monitoring wells outside of the fenced landfill area, with the exception of lead detected at a maximum concentration of 1.6 μg/l.

Two new and nine existing Homewood monitoring wells were sampled during the Focused Remedial Investigation subsequently performed by Cooper Industries. Only very low levels of acetone, methylene chloride, toluene, TCE, vinyl chloride, bis(2-ethylhexyl)phthalate and lead were detected in the samples, all at levels well below concern. Acetone and methylene chloride are suspected laboratory contaminants and bis(2-ethylhexyl)phthalate is a plasticizer often encountered when plastic sampling equipment is used. The only inorganic detected was lead in only one sample at a concentration of 5.4 μg/l. The action level for lead in drinking water is 15 μg/l and the background concentration for lead in the Burgoon Aquifer is estimated to be about 3 μg/l.

Only sporadic Site-related VOCs were found above the analytical detection limits in any of the wells sampled as part of this subsequent investigation. Furthermore, none of the VOCs detected were above MCLs.

C. Connoquenessing and Burgoon Aquifers

During the investigations conducted in the 1980s, only very low concentrations of TCE were detected sporadically in the Connoquenessing Aquifer directly below the fill area, while no VOCs were detected in Burgoon monitoring wells screened below the Site. Sporadic detections of pentachlorophenol were found in some of the Burgoon monitoring wells within the fenced area, but no pentachlorophenol was detected in wells outside of the fenced area. No inorganics were detected at levels of concern from the Connoquenessing or Burgoon monitoring wells within the fenced area. Only very low concentrations of one VOC and one SVOC were detected in Connoquenessing wells outside of the fenced area, and only low concentrations of five VOCs and one SVOC were detected in a Burgoon monitoring well. Inorganics were below detection limits in all of the Burgoon wells outside of the fence, and one very low lead detection was encountered in one Connoquenessing well outside of the fenced area..

At the time of the 1990 ROD, Cooper Industries asserted that the vinyl chloride detections in the Burgoon Aquifer were due to leakage of contaminated ground water from the onsite water table along a well casing. Since detections of contaminants were sporadic and low but near MCLs, EPA did not select a remedial action for the Connoquenessing and Burgoon aquifers in the 1990 ROD. Instead EPA required resampling of the Homewood, Connoquenessing and Burgoon Aquifer wells which showed contamination in the 1989 RI report. Based on the 1989 NUS report, EPA was also concerned that the Grove City municipal wells might be drawing water from beneath the Site to the northwest. EPA required the installation of three well nests between the Site and the Grove City wells in the Connoquenessing and Burgoon Aquifers to see if contaminants were moving towards the municipal wells and to act as a warning system. These wells were at about an equal radius from the Site and were spread out to increase the chance of detecting a contaminant plume.

During the subsequent investigation, VOCs were not detected in the previously installed monitoring wells that were sampled. Pentachlorophenol was also not found in any of the Burgoon or Connoquenessing samples. Very low concentrations of lead and bis(2-ethylhexyl) phthalate were detected at levels below drinking water limits.

Very low levels of acetone, 2-butanone, 4-m-2-pentanone, toluene, bis(2-ethylhexyl) phthalate, and lead were detected in the samples from the new monitoring wells installed as part of the subsequent investigation. All of the compounds were detected below MCLs. Again, acetone, 2-butanone and 4-m-pentanone are suspected laboratory contaminants and bis(2-ethylhexyl)phthalate is a plasticizer and often encountered when plastic sampling equipment is used. The maximum toluene concentration (4 ug/l) was well below the MCL (1000 μg/l) and may not be Site related. Lead was detected in only one sample (7.7 μg/l) above the probable background level of 3 μg/l. This concentration is substantially below the drinking water action level of 15 μg/l.

Site-related VOCs such as vinyl chloride were not detected in either the newly installed or the previously installed monitoring wells. The data indicates that the Connoquenessing and Burgoon Aquifers are not currently impacted above safe levels. Furthermore, all compounds detected in the new monitoring wells were below MCLs.

D. Wetlands Sediments

The 1989 Remedial Investigation collected sediment samples from the wetland area to the southeast of the landfill and found that the samples contained low levels of PCBs and PAHs. The presence of these contaminants may have been due to surface runoff from the disposal area. Sediment samples from the offsite pond did not appear to be impacted by the landfill. Some bioassay studies were performed during the investigation, however, the results were questionable because highest mortality occurred in the control samples. Although the results of chemical analysis of the sediments showed levels that were not expected to present a problem, EPA recommended delaying a decision until the bioassay tests could be repeated and some PCB bioaccumulation studies were performed.

In the subsequent Focused Remedial Investigation, Cooper Industries conducted bioaccumulation studies to evaluate whether contaminants were present in the food chain in the wetland at the southwest corner of the landfill. These studies did not detect Aroclor 1254 (PCBs) in the earthworm samples analyzed. Additionally, the bioassay studies performed on fathead minnow and ceriodaphnia using interstitial water obtained from wetland sediments did not show any effects from the Site. Toxicity effects in the bioassay using interstitial water from offsite pond sediments were concluded to be not related to the Site, but rather to the strip mine spoil. The report on the wetland studies concluded that the low level of contamination in the wetland has not had a measurable impact on its environment. EPA agrees with the conclusions presented in the report and has concluded that no remedial action is warranted for the wetlands studied. Additional details on the studies follow:

NUS Bioassay Testing: Three sediment samples were collected from the offsite pond in June 1988 for bioassay testing in order to determine whether the Site contaminants had affected the biota in the pond. Elutriates were generated from the sediments to perform the following tests: Fathead minnow (total mortality percentage was measured); Ceriodaphnia (survival percentage was measured); and Ceriodaphnia (reproduction rate was measured).

The first fathead minnow sample indicated that a 100 percent concentration of elutriate (i.e., undiluted) was toxic to the aquatic organisms. The other two samples did not reflect an expected dose-response relationship. The mortality rate was similar for all elutriate concentrations in the second sample. The third sample reflected acute toxicity for the 100 percent elutriate dose (the response was 100 percent mortality), but other elutriate concentrations were not representative of the expected dose and response. Ceriodaphnia tests (survival percentage and reproduction rate) reflected acute toxicity patterns for all three samples. Ceriodaphnia reproduction rates also decreased as the concentration of elutriate increased. However, this decrease was not observed until the 50 percent and 100 percent elutriate concentrations were applied.

The study concluded that because the offsite pond analytical results (i.e., surface water and sediment samples) did not display site-associated contaminants, the adverse effects on the bioassay samples were not attributable to the Site.

In June 1989, sediment and surface water samples were collected to assess whether contaminated sediments detected in the wetland would have an impact on biota. The same three tests were conducted as with the initial bioassay testing. The fathead minnow mortality rates were inconclusive for the following reasons: control samples (i.e., 0 percent elutriate) reflected mortality rates ranging from 23 to 92 percent; background surface water and sediment bioassay samples exhibited higher mortality rates than samples collected from the wetland area which is contaminated with Arochlor-1254 and PAHs; and there was no linear dose-response relationship for any of the fathead minnow bioassays. The ceriodaphnia results were also inconclusive. No linear dose-response relationship was observed for the survival rate of the Ceriodaphnia. Reproduction rates (number of young produced) for the Ceriodaphnia reflected an unusual dose-response relationship.

Analysis of the elutriates did not detect organic or inorganic contamination. No obvious laboratory error (low dissolved oxygen, temperature fluctuations, etc.) was noted in the data validation. An explanation as to why the background samples (i.e., those samples collected from the influent stream) exhibited greater acute toxicity than samples collected from the wetland was not apparent.

Focused RI/FS Bioaccumulation Study: Aroclor 1254 was not detected in the earthworm composite samples collected from either the reference site or the wetland.

Focused RI/FS Bioassay Study: The results of bioassays performed on fathead minnow and Ceriodaphnia using interstitial water obtained from sediments collected from the wetland indicate that Site contaminants have not measurably impacted the wetland. However, the Offsite Pond (background) samples displayed toxicity to the fathead minnows and Ceriodaphnia. The observed toxicity may be attributable to surface runoff from mine spoil piles or mine tailing, and has not been shown to be related to Site-associated contaminants.

Additional details on all studies can be found in the Administrative Record.

VII. SUMMARY OF SITE RISKS

Following the Remedial Investigation, analyses were conducted to estimate the human health and environmental hazards that could result if contamination at the Site is not cleaned up. These analyses are commonly referred to as risk assessments and identify existing and future risks that could occur if conditions at the Site do not change. The Baseline Human Health Risk Assessment ("BLRA") evaluated human health risks and the Ecological Risk Assessment ("ERA") evaluated environmental impacts from the Site.

A. Human Health Risks

1. Data Collection and Evaluation

Data used in the Risk Assessment was collected by Cooper Industries, and because this was a focused RI/FS, it was subjected to limited data validation by their contractor. There already was a body of data available from the 1989 Remedial Investigation that had been subjected to M3 data validation. To verify that the analytical data from Cooper Industries was of high quality, EPA had the U.S. Geological Survey split samples with Cooper Industries. The samples were analyzed by EPA's Central Regional Laboratory, and the data was subjected to M3 data validation (highest level of data validation). This data was compared to the results obtained from Cooper Industries and the results were consistent.

Section 2.3 of the Risk Assessment subjected the data screening to limit the risk assessment calculations to contaminants of concern and eliminating data which did not pass the screening criteria. For additional details, please see section 2.3 of the Risk Assessment.

The data collected and described in the previous section (Section VI - Nature and Extent of Contamination) were evaluated for use in the BLRA. This evaluation involved reviewing the quality of the data to determine which are appropriate to use to quantitatively estimate the risks associated with Site soil, sediment, surface water, and ground water. The concentrations used to determine human health risks are derived by averaging the data for each media and then calculating the upper 95th percentile confidence limit. By using this upper confidence limit, EPA can be 95% certain that the true average concentration does not exceed this level. This concentration is referred to as the reasonable maximum exposure ("RME") concentration because an individual would not reasonably be expected to be exposed to a higher concentration. The RME values calculated based in the Site data are summarized in Table 4.

2. Exposure Assessment

An exposure assessment involves three basic steps: 1) identifying the potentially exposed populations, both current and future; 2) determining the pathways by which these populations could be exposed; and 3) quantifying the exposure. Under current Site conditions, the BLRA identified the following populations as having the potential for exposure to Site-related contaminants, either currently and/or in the future:

- future residents
- current residents

To EPA's knowledge, no residents are currently using contaminated ground water at the Site, since the water line was extended around the perimeter of the Site and the Eickmann residence is using public water. Only one resident close enough to the contaminant plume to be at risk is using ground water currently and this well has been tested four times and has not contained Site contaminants. Therefore, only the future use scenario was calculated.
The pathways evaluated were as follows:

- Ingestion of ground water by adults and children;
- Inhalation of VOCs during showering by adults using the Foster and Chrostowski Model (1987); and
- Dermal contact with ground water by adults while showering and children while bathing.

3. Toxicity Assessment

The purpose of the toxicity assessment is to weigh available evidence regarding the potential for particular contaminants to cause adverse effects in exposed individuals. Where possible, the assessment provides a quantitative estimate of the relationship between the extent of exposure to a contaminant and the increased likelihood and/or severity of adverse effects. A toxicity assessment for contaminants found at a Superfund Site is generally accomplished in two steps: 1) hazard identification, and 2) dose-response assessment. Hazard identification is the process of determining whether exposure to an agent can cause an increase in the incidence of a particular adverse health effect (e.g., cancer or birth defects) and whether the adverse health effect is likely to occur in humans. It involves characterizing the nature and strength of the evidence of causation.

Dose-response evaluation is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the contaminant administered or received and the incidence of adverse health effects in the administered population. From this quantitative dose-response relationship, toxicity values (e.g., reference doses and slope factors) are derived that can be used to estimate the incidence or potential for adverse effects as a function of human exposure to the agent. These toxicity values are used in the risk characterization step to estimate the likelihood of adverse effects occurring in humans at different exposure levels.

For the purpose of the risk assessment, contaminants were classified into two groups: potential carcinogens and noncarcinogens. The risks posed by these two types of compounds are assessed differently because noncarcinogens generally exhibit a threshold dose below which no adverse effects occur, while no such threshold has yet been proven to exist for carcinogens. As used here, the term *carcinogen* means any chemical for which there is sufficient evidence that exposure may result in continuing uncontrolled cell division (cancer) in humans and/or animals. Conversely, the term *noncarcinogen* means any chemical for which the carcinogenic evidence is negative or insufficient.

Slope factors have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic contaminants of concern. Slope factors, which are expressed in units of $(mg/kg/day)^{-1}$ are multiplied by the estimated intake of a potential carcinogen, in mg/kg/day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the slope factor. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Slope factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied to account for the use of animal data to predict effects on humans. Slope factors used in the baseline risk assessment are presented in Table 3.

Reference doses ("RfDs") have been developed by EPA for indicating the potential for adverse health effects from exposure to contaminants of concern exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg/day, are estimates of acceptable lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of contaminants of concern from human epidemiological studies or animal studies to which uncertainty factors have been applied to account for the use of animal data to predict effects on humans. Reference doses used in the baseline risk assessment are presented in Table 3 below.

TABLE 3 - SLOPE FACTORS AND REFERENCE DOSES FOR SITE CONTAMINANTS

Chemical	Weight of Evidence Classification for Carcinogenicity	CPSo Oral Slope Factor (mg/kg/day)$^{-1}$	RfdDo Chronic Oral Reference Dose (mg/kg/day)	CPSi Inhalation Slope Factor (mg/kg/day)$^{-1}$	RfDi Chronic Inhalation Reference Dose (mg/kg/day)
Benzene	A	2.9E-2 (I)	3.0E-4 (NCEA)+	2.9E-02 (I)	1.71E-3 (NCEA)+
2- Butanone	D	N/A	6.0E-1 (I)	N/A	2.86E-1 (I)
1,2-Dichloroethane	B2	9.1E-02 (I)	0.03 (NCEA)+	9.1E-02 (I)	2.86E-3 NCEA)+
Vinyl Chloride	A	1.9 (H)	N/A	3.0E-01 (H)	N/A

Notes: Weight of Evidence Classification for Carcinogenicity:
A - Human Carcinogen
B2 - Probable Human Carcinogen
D - Not Classifiable as to Human Carcinogenicity (inadequate or no data)
(I) Integrated Risk Information System, Iris
(H) Health Effects Assessment Summary Tables, HEAST
(NCEA) EPA Superfund Technical Support, National Center for Environmental Assessment
N/A Not Applicable
- Supporting information available in risk assessment, appendix E

4. Human Health Effects

The health effects of the Site contaminants that are most associated with the unacceptable risk levels are summarized below. In most cases, the information in the summaries is drawn from the Public Health Statement in the Agency for Toxic Substances and Disease Registry's (ATSDR) toxicological profile for the chemical.

BENZENE

Benzene is a colorless liquid with a sweet odor. Benzene evaporates into air very quickly and dissolves slightly in water. Benzene found in the environment is from both human activities and natural processes. Benzene was first discovered and isolated from coal tar in the 19th century. Today, benzene is made mostly from petroleum sources. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

Benzene can enter the body through the lungs when breathing contaminated air. It can also enter through the stomach and intestines when eating food or drinking water that contains benzene. Benzene can also enter the body through skin contact with benzene-containing products such as gasoline. Brief exposure (5 to 10 minutes) to very high levels of benzene in air (10,000 - 20,000 ppm) can result in death. Lower levels (700 - 3,000 ppm) can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness.

Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, coma, and death. The health effects that may result from eating or drinking foods containing lower levels of benzene are not known. Benzene that is spilled on skin may cause redness and sores. Benzene that enters eyes may cause general irritation and cornea damage.

People who breathe benzene for long periods may experience harmful effects in the tissues that form blood cells, especially the bone marrow. These effects can disrupt normal blood production and cause a decrease in important blood components. A decrease in red blood cells can lead to anemia. Reduction in other components in the blood can cause excessive bleeding. Excessive exposure to benzene can be harmful to the immune system, increasing the chance for infection and perhaps lowering the body's defense against cancer. Benzene can cause cancer of the blood-forming organs.

Exposure to benzene has also been linked with damage to chromosomes. Exposure to benzene may also be harmful to the reproductive organs. Studies with pregnant animals showed that breathing benzene has harmful effects on the developing fetus. These effects included low birth weight, delayed bone formation, and bone marrow damage.

2-BUTANONE

2-butanone, also known as methyl ethyl ketone (MEK), is a colorless liquid with a sweet but sharp odor. 2-butanone can enter the body by breathing air that contains it, through direct contact with skin, or through consumption of food or water that contains 2-butanone.

2-butanone can enter the environment in a number of different ways. It can enter the air or water from the waste of manufacturing plants. 2-butanone is present in many different types of paints and glues used both in the home and in industry. As these products dry, 2-butanone will enter the air. 2-butanone is also released in the exhaust of cars and trucks. Some trees also release 2-butanone to the air. 2-butanone is found naturally in some foods, and individuals may also be exposed to 2-butanone by smoking cigarettes.

The main health effects that have been seen in humans who breathed higher concentrations of 2-butanone are mild irritation of the nose, throat, eyes, and skin.

Serious health effects in animals have been seen only at very high concentrations of 2-butanone. These high concentrations are not expected in the usual use of 2-butanone or in the vicinity of hazardous waste sites. Studies in animals have shown that 2-butanone does not cause serious damage to the nervous system or the liver, but mice that breathed low levels for a short time had temporary behavioral effects. 2-butanone alone does not have serious effects on the liver or nervous system, but it can cause other chemicals to become more harmful to these systems.

Guinea pigs, rats, and mice that breathed high levels of 2-butanone for a short time became unconscious and died. Pregnant rats and mice that breathed air containing high levels of 2-butanone had underdeveloped fetuses. The rats that swallowed very high concentrations of 2-butanone in water also developed signs of nervous system effects such as inactivity, drooping eye lids, and uncoördinated muscle movement. Some rats and mice that swallowed water containing high concentrations of 2-butanone died. Rats that received water containing a lower concentration of 2-butanone had mild kidney damage. Skin irritation developed in rabbits and guinea pigs that had small amounts of 2-butanone placed on their skin. Rabbits that had small amounts of 2-butanone placed in their eyes had serious eye irritation. Reproductive effects were not seen in animals exposed to 2-butanone.

1,2-DICHLOROETHANE

1,2-dichloroethane is a clear, man-made liquid that is not found naturally in the environment. It evaporates at room temperature and has a pleasant smell and a sweet taste. 1,2-dichloroethane is used primarily to make vinyl chloride and several solvents that remove grease, glue, and dirt. In the past it was also found in trace amounts in solvents that industry used to clean cloth, remove grease from metal, and to break down oils, fats, waxes, resins, and rubber.

Humans are exposed to 1,2-dichloroethane primarily by breathing it in air or by drinking contaminated water. This can happen where the chemical has been disposed of or spilled onto the ground. 1,2-dichloroethane has also been found in the air near industries where it is made or used in manufacturing. Humans can also be exposed to low levels of 1,2-dichloroethane in the home by using old products formerly made with 1,2-dichloroethane, such as cleaning agents, pesticides, and glued wallpaper and carpet. These levels are reportedly not high enough to cause significant adverse health effects.

1,2-dichloroethane can enter the body when people breathe contaminated air or drink contaminated water. Studies in animals also show that 1,2-dichloroethane can enter the body through the skin. Humans are most likely to be exposed by using contaminated water containing 1,2-dichloroethane or by breathing 1,2-dichloroethane that escapes from contaminated water and soil into the air.

1,2-dichloroethane can cause cancer when large doses are eaten by laboratory animals, and tumors of the lung when put on the skin of laboratory animals. Provided that humans reacted the same way as animals, people who eat or drink high concentrations of 1,2-dichloroethane for a lifetime might also develop cancer. People who have had their skin exposed to high levels of 1,2-dichloroethane for a long time may develop benign tumors. Inhalation of

1,2-dichloroethane may also possibly cause cancer. The likelihood of this happening increases with increasing exposure to 1,2-dichloroethane as well as other carcinogens, and depends on how susceptible an individual is to this chemical.

People who were accidentally exposed to large amounts of 1,2-dichloroethane in air or who accidentally or intentionally swallowed 1,2-dichloroethane have developed heart, lung, and liver damage and nervous disorders. However, the levels of 1,2-dichloroethane that caused these effects are unknown.

In experiments where animals inhaled air containing 400 parts per million (ppm) or higher of 1,2-dichloroethane for about 14 days, most of the animals died. Liver and kidney damage and blood disorders were also seen in these animals. Long-term exposure to lower doses also caused liver, kidney, and heart disease. Blood disorders, liver disease, and reduced ability to fight infection have been seen in experimental animals that ate or drank materials contaminated with 1,2-dichloroethane.

VINYL CHLORIDE

Vinyl chloride is a colorless gas at normal temperatures. It is flammable as a gas and is not stable at high temperatures or pressure. Vinyl chloride will exist in liquid form if it is kept under high pressure. All vinyl chloride is manmade or results from the breakdown of other manmade substances, such as trichloroethylene, trichloroethane, and tetrachloroethylene. Most of the vinyl chloride produced in the United States is used to make polyvinyl chloride (PVC). PVC is used to make a variety of plastic products, including pipes, wire and cable coatings, and packaging materials.

Most of the vinyl chloride that enters the environment comes from the plastics industries, which release it into the air or into waste water. Vinyl chloride is a breakdown product of other manmade chemicals in the environment. Vinyl chloride has been found in tobacco smoke, perhaps as a result of the manufacturing process.

Liquid vinyl chloride evaporates easily into the air. Vinyl chloride in water or soil evaporates rapidly if it is near the surface. Vinyl chloride in the air breaks down in a few days. When vinyl chloride breaks down in air, it can form other harmful chemicals (e.g., hydrochloric acid, formaldehyde, formyl chloride, carbon monoxide, chloroacetaldehyde, acetylene, chloroethylene epoxide, and chloroacetylchloranil). A limited amount of vinyl chloride can dissolve in water. It can enter ground water and can also be found in ground water from the breakdown of other chemicals. Vinyl chloride does not typically build up in plants or animals.

An individual breathing high levels of vinyl chloride will feel dizzy or sleepy. These effects occur within five minutes at about 10,000 ppm of vinyl chloride. Death may occur with exposure to extremely high levels of vinyl chloride. Concentrations found at the Osborne Site are orders of magnitude below these types of concentrations.

Studies in animals show that extremely high levels of vinyl chloride can damage the liver, lungs, and kidneys. These levels can also damage the heart and prevent blood clotting. The effects of drinking high levels of vinyl chloride are unknown. If liquid vinyl chloride is spilled on the skin, it will numb the skin and cause redness and blisters. This would likely be due to the rapid evaporation that can cause localized frostbite.

Some people who have breathed vinyl chloride over several years have developed changes in their liver structure. The likelihood of developing these changes increases with breathing higher levels of vinyl chloride. Some people who have worked with vinyl chloride have developed nerve damage, and others have developed an immune reaction. The lowest levels that cause liver changes, nerve damage, and the immune reaction in humans are not known. Certain jobs related to polyvinyl chloride production exposes workers to very high levels of vinyl chloride. Some of these workers have problems with the blood flow in their hands. In some of these people, changes have appeared on the skin of their hands and forearms. Also, bones at the tips of their fingers have broken down. Studies suggest that some people may be more sensitive to these effects than others.

Some men who work with vinyl chloride have complained of a lack of sex drive. Results of studies in animals show that long-term exposure may damage the sperm and testes. Some women who work with vinyl chloride have had irregular menstrual periods. Some have developed high blood pressure during pregnancy. Studies of women who live near vinyl chloride manufacturing plants could not prove that vinyl chloride causes birth defects. Studies using pregnant animals show that breathing vinyl chloride may harm their unborn offspring. Animal studies also show that vinyl chloride may cause increased numbers of miscarriages early in pregnancy. It also causes decreased weight and delayed skeletal development in fetuses. The same very high levels of vinyl chloride that caused these fetal effects also caused adverse effects in the pregnant animals.

Results from several studies suggest that breathing air or drinking water containing low levels of vinyl chloride may increase the risk of getting cancer. Studies of workers who have breathed vinyl chloride over many years showed cancer of the liver. Brain cancer, lung cancer, and some cancers of the blood also may be connected with breathing it daily for several years. Studies of long-term exposure in animals show that increases in cancer of the liver and mammary gland may occur at very low levels of vinyl chloride in the air. Studies show that animals fed low levels of each day during their lifetime had an increased risk of getting liver cancer.

5. Risk Characterization

The risk characterization process integrates the toxicity and exposure assessments into a quantitative expression of risk. For carcinogens, the exposure point concentrations and exposure factors discussed earlier are mathematically combined to generate a chronic daily intake value that is averaged over a lifetime (i.e., 70 years). This intake value is then multiplied by the toxicity value for the contaminant (i.e., the slope factor) to generate the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the contaminant. The National Oil and Hazardous Substances Pollution Contingency Plan ("NCP") established acceptable levels of carcinogenic risk for Superfund sites ranging from one excess cancer case per 10,000 people exposed to one excess cancer case per one million people exposed. This translates to a risk range of between one in 10,000 and one in one million additional cancer cases. Expressed as scientific notation, this risk range is between 1.0E-04 and 1.0E-06. Remedial action is warranted at a site when the calculated cancer risk level exceeds 1.0E-04. However, since EPA's cleanup goal is generally to reduce the risk to 1.0E-06 or less, EPA also may take action where the risk is within the range between 1.0E-04 and 1.0E-06.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (i.e., the chronic daily intake) with the toxicity of the contaminant for a similar time period (i.e., the reference dose). The ratio of exposure to toxicity is called a hazard quotient. A Hazard Index ("HI") is generated by adding the appropriate hazard quotients for contaminants to which a given population may reasonably be exposed. The NCP also states that sites should not pose a health threat due to a non-carcinogenic, but otherwise hazardous, chemical. If the HI exceeds one (1.0), there may be concern for the potential non-carcinogenic health effects associated with exposure to the chemicals. The HI identifies the potential for the most sensitive individuals to be adversely affected by the noncarcinogenic effects of chemicals. As a rule, the greater the value of the HI above 1.0, the greater the level of concern.

Risks from Clarion Aquifer and Mine Void System

The current land use immediately surrounding the property is residential and agricultural. The only current domestic ground water use near the Site is the Kring residential well. Site-related contaminants analyzed for in samples from the Kring well have been below method detection limits. The other six downgradient residences near the Site (Breese, Dinninger, Donnelly, Dunn, Eickmann and Lazor) are on a public water supply. Because no Site-related contaminants were identified in the Kring well, which is nearer to the Site than the other wells, current ground water use was not considered to be of concern and was not further considered in the risk assessment. The BLRA did evaluate the potential risk to future residents who could use ground water from the Clarion Aquifer and Mine Void System. Although future residents in the area would likely use the public water supply, this approach provides a conservative estimate of potential Site risk. These risks are presented in Table 4 below.

The ground water contamination at the Site appears to be located in the mine pool underlying the Clarion Aquifer. During the Remedial Investigation conducted in 1989, only one well in the Clarion Aquifer was contaminated (at 6 µg/l), while many of the wells in the mine pool showed at higher levels (up to 47 µg/l). During the most recent sampling conducted in 1995 as part of the subsequent Focused Remedial Investigation, wells in the Clarion Aquifer did not show contamination except for the Eickmann residential well. The BLRA estimates that potential cancer risk to future residents using the Clarion Aquifer and Mine Void System to be 2.1E-05 for children and 4.6E-05 for adults, both within the acceptable range of 1.0E-04 to 1.0E-

06. Similarly, the potential non-carcinogenic risks for both children (HI = 0.24) and adults (HI = 0.13)are below the acceptable level (HI=1.0). Although some mine pool wells continue to contain at levels above the MCL of 2 µg/l, the levels have been declining. For example, the monitoring well which had the highest concentration (47 µg/l) showed a decrease to 5 µg/l in the 1993 sampling. The only contaminated residential well (Eickman well) showed a decline from a high of 16 µg/l to an average of about 5 ug/l in recent sampling. The risk assessment used 16 ug/l the maximum concentration found in the Eickmann well.

Because elevated concentrations of vinyl chloride were detected in an existing residential well (the Eickmann well), the BLRA also considered the scenario whereby a future resident would use this well for drinking water. While this scenario is unlikely since public water is available, it presents a worst-case estimate of potential risk. The cancer risk to future residents using ground water of the quality found in the Eickmann well would be 1.7E-04 for children and 3.7E-04 for adults, both exceeding EPA's acceptable range. As discussed earlier, the Clarion Aquifer is very fractured and the Eickman well, which is the closest to the fill material, extends to just above the mine pool. This well appears to draw water from the mine pool resulting in an elevated level of a maximum of 16 µg/l. This residence has been connected to public water eliminating the current direct risk from contaminated ground water in this well.

Risks from Homewood, Connoquenessing and Burgoon Aquifers

During the 1989 Remedial Investigation, TCE was present (5.8 µg/l maximum; 0.4 µg/l mean) in the Homewood Aquifer. The maximum TCE level is slightly above the MCL (5 ppb), and was detected below the MCL. During the recent sampling events, no Site-related contaminants were found above MCLs in the Homewood Aquifer. Some very low levels of VOCs were detected at levels substantially below the MCLs. The contaminants butanone, pentanone, toluene and bis(2-ethylhexyl)phthalates are suspected lab contaminants. Comparison to Site contaminants to those found in the previous remedial investigation indicates that these VOCs are not Site-related.

Low levels of contamination (at or below the MCL) were found sporadically in a very small number of well samples taken from the the Connoquenessing and Burgoon Aquifers during the 1989 Remedial Investigation. During recent sampling events, wells in these formations showed only trace levels of VOCs all well below the MCLs. The potential risk to future residents using ground water from these aquifers is presented in Table 4. The estimated cancer risks are 5.4E-06 and 1.2E-05 to children and adults, respectively. These risk levels are within EPA's acceptable risk range.

Table 4 Human Health Risks				
Group of Individuals	Hazard Index		Cancer Risk	
	Child	Adult	Child	Adult
Future residents using the Clarion Aquifer or ground water from the mine voids	0.24	0.13	2.1E-05	4.6E-05
Future resident using the Homewood, Connoquenessing and Burgoon Aquifers	N/A	N/A	5.4E-06	1.2E-05

Note: Cancer risks in the above table are based on the exposure point concentrations shown below and the statistical methods shown in this table.These represent RME or maximum risks (see table 5 below). Cancer risks based on Central Tendency calculations are lower as shown in table 6-6 of the Risk Assessment which compares upper bound cancer risks to those calculated using the central tendency statistical method.

Table 5 - Exposure Point Concentrations

VARIABLE	RANGE	MIDPOINT (MEAN)	VALUE USED	RATIONAL
Concentration in Ground Water, (u/l)				
Clarion Aquifer &Mine Void				
Benzene	<1-5	0.7	1	Upper Confidence Limit - Mean
1,2-Dichloroethane	<1-2	0.5	0.6	Upper Confidence Limit- Mean
Vinyl Chloride	<1-5	1.4	1.9	Upper Confidence Limit- Mean
Burgoon, Connoquenessing & Homewood				
Vinyl Chloride	<1-0.6j	0.5	0.5	95th percentile upper confidence limit
Eickman Residential Well				
Vinyl Chloride	<1-16	10.2	16	Maximum Value Used due to small sample size

B. Ecological Risk Assessment

Since the Remedial Investigation of the wetlands to the southwest of the site showed that the wetlands had not been impacted and since EPA's Biological Technical Assistance Group agreed with the report's conclusion that no action was warranted, a detailed ecological risk assessment was not conducted.

VIII. DESCRIPTION OF ALTERNATIVES

In the Feasibility Study ("FS"), engineering technologies applicable to remediating the contaminated media were screened according to their effectiveness and implementability. Those technologies remaining after the screening process were then developed into the following remedial alternatives.

CLARION FORMATION ALTERNATIVES

Alternative CM-1 - No Action:

Capital Cost:	$0
Total Present Worth Cost:	$0
O&M Annual Cost :	$0
Time to Implement (years):	0
Est. Years to Achieve MCLs	5

The no-action alternative is considered as a baseline for comparison with other alternatives. Section 300.430(e)(6) of the NCP requires that EPA consider a "No Action" alternative for every Superfund Site to establish a baseline or reference point against which each of the remedial action alternatives are compared. In the event that the other identified alternatives do not offer substantial benefits in the reduction of toxicity, mobility, or volume of the constituents of concern, the No Action alternative may be considered a feasible approach. This alternative leaves the Site undisturbed and all current and potential future risks would remain. Under this alternative, the Clarion Aquifer and mine void system would not be actively remediated or monitored.

Alternative CM-2 - Natural Attenuation with Monitoring:

Capital Cost:	$37,000
Total Present Worth Cost:	$348,700
O&M Annual Cost :	$38,300
Time to Implement (years):	0
Est. Years to Achieve MCLs	5

This alternative includes sampling existing monitoring wells and one new monitoring well to track the continuing natural attenuation of vinyl chloride in the ground water. Monitoring of the Clarion Aquifer and mine void system has shown the contaminant concentrations have been decreasing with time, and would likely achieve MCLs without active remediation .

Ground water monitoring would consist of sampling four wells in the mine void on a quarterly basis (MWV-4, MWV-6, MWV-7 and MWV-8). Six wells in the Clarion Aquifer would be monitored semi-annually (MWC-2, MWC-3, MWC-4, MW-7, MW-8, and MW-9). Nine wells in the mine void system would be monitored semi-annually (MWV-1 through MWV-8). One new monitoring well (MWV-9) would be installed in the mine voids to supplement the existing network. The wells sampled would be located at the boundary of the plume and within the plume to monitor both migration and attenuation of the contamination. In addition, two residential wells (the Kring and Parker wells), would be monitored quarterly. These residential wells would be monitored in addition to the two residential wells (Eickmann and Dunn) being monitored as part of the OU1 remedial action. At the time of the FS, the Breese well was included in this alternative, but this residence has connected to the water line and the well has been closed. The ground water samples will be analyzed for low level TCL VOCs by EPA method 524.2, with results summarized in annual reports. Monitoring will continue for five years after MCLs are reached.

In addition to the wells discussed above, 12 performance monitoring wells located on the perimeter of the landfill in both the Homewood and Clarion Aquifers, and two additional residential wells would be monitored as part of the OU1 Remedial Action. The wells would be sampled semi-annually and analyzed for TCL volatile and semi-volatile organic compounds and TAL metals to assure that the landfill is not releasing contaminants into the aquifer.

Alternative CM-3 - In-Situ Biodegradation of Mine Void:

Capital Cost:	$1,359,000
Total Present Worth Cost:	$1,830,000
O&M Annual Cost :	$117,000
Time to Implement (years):	2
Est. Years to Achieve MCLs	4

This alternative involves the injection of nutrients and oxygen into the mine void to stimulate biological activity that would consume contaminants. A ground water extraction and reinjection system would be installed to circulate the water in the mine void to distribute the nutrients and oxygen over an area of about 29 acres. This alternative would not include the injection of nutrients and oxygen into the Clarion Aquifer because the transmissivity of the sandstone prevents circulation and delivery of oxygen and nutrients. Any residual contaminants detected in the Clarion Aquifer would be allowed to disperse naturally. Ground water monitoring would be performed during the treatment program to monitor progress of remediation and would continue for five years following completion of remedial action.

Alternative CM-4 - Air Sparging:

Capital Cost:	$1,362,000
Total Present Worth Cost:	$1,910,000
O&M Annual Cost :	$73,400
Time to Implement (years):	2
Est. Years to Achieve MCLs	4

Air sparging involves in-situ stripping of VOCs from contaminated water. Injection and circulation wells would be installed in the mine void to inject air into the water and circulate it through the voids. Additionally, a trench-type vapor-extraction system would be installed in the farm fields to the north and east of the Site to remove VOCs transported to the unsaturated zone above the water table by the sparging. The off-gases from the vapor-extraction system would be passed through activated carbon to control VOC emissions. Ground water monitoring would be performed during the treatment program to monitor progress of remediation and would continue for five years following completion of remedial action.

Alternative CM-5 - Ground Water Extraction from the Mine Voids, Treatment, and Reinjection to the Mine:

Capital Cost:	$854,000
Total Present Worth Cost:	$1,349,000
O&M Annual Cost :	$119,500
Time to Implement (years):	2
Est. Years to Achieve MCLs	4

Wells would be installed within the mine void to extract water which would be treated by air stripping to remove VOCs. The off-gases from the air stripper would be passed through activated carbon to remove VOCs prior to release to the atmosphere. Treated water would be reinjected into the mine void using the OU1 Injection Wells at the perimeter of the contaminant plume to induce water circulation within the area of concern and to establish a gradient inward toward the extraction wells. One additional injection well would need to be installed. Monitoring of the mine void water and Clarion Aquifer would continue for five years following completion of this action.

HOMEWOOD, CONNOQUENESSING AND BURGOON AQUIFER ALTERNATIVES

Alternative HCB1 - No Action:

Capital Cost:	$0
Total Present Worth Cost:	$0
O&M Annual Cost :	$0
Time to Implement (years):	0

The no-action alternative is considered as a baseline to compare with other alternatives. For this alternative, the aquifers would not be actively remediated or monitored.

Alternative HCB2 - Natural Attenuation with Monitoring:

Capital Cost:	$0
Total Present Worth Cost:	$82,600
O&M Annual Cost :	$22,800
Time to Implement (years):	0

This alternative includes monitoring of existing wells in the Connoquenessing (CW-1, CW-2, and CW-3), and Burgoon (BW-1, BW-2, and BW-3), Aquifers to verify contamination is not migrating from the Site toward community wells. This alternative will be implemented after source containment (OU1 remedial action). Monitoring of water quality would be performed using the EPA analytical method 524.2 for TCL volatiles. Ground water monitoring will consist of sampling three wells in the Connoquenessing Aquifer and three wells in the Burgoon Aquifer for three years after issuance of this ROD on a semi-annual basis to confirm past monitoring results. The samples will be analyzed for low level TCL VOCs with results summarized in annual reports.

WETLAND SEDIMENTS

Since the wetland sediments did not contain significant contamination, no alternatives were evaluated.

IX. COMPARATIVE EVALUATION OF ALTERNATIVES

Each of the the remedial alternatives summarized in this ROD has been evaluated against the nine (9) evaluation criteria set forth in the NCP, 40 C.F.R. Section 300.430(e)(9). These nine criteria can be categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. A description of the evaluation criteria is presented below:

Threshold Criteria:

1. *Overall Protection of Human Health and the Environment* addresses whether a remedy provides adequate protection and describes how risks are eliminated, reduced, or controlled.

2. *Compliance with Applicable or Relevant and Appropriate Requirements* (ARARs) addresses whether a remedy will meet all of the applicable, or relevant and appropriate requirements of environmental statutes.

Primary Balancing Criteria:

3. *Long-term Effectiveness* refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals are achieved.

4. *Reduction of Toxicity, Mobility, or Volume through Treatment* addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume of contaminants.

5. *Short-term Effectiveness* addresses the period of time needed to achieve protection and any adverse impacts on human health and environment that may be posed during the

construction and implementation period until cleanup goals are achieved.

6. *Implementability* addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. *Cost* includes estimated capital, operation and maintenance costs, and present worth costs.

<u>Modifying Criteria</u>:

8. *State Acceptance* indicates whether, based on its review of backup documents and the Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.

9. *Community Acceptance* includes assessments of issues and concerns the public may have regarding each alternative based on a review of public comments received on the Administrative Record and the Proposed Plan.

A. Overall Protection of Human Health and the Environment

All of the alternatives are protective of human health in the short term because to EPA's knowledge, there are no residents using contaminated ground water. The Grove City water line was extended around the perimeter of the Site by Cooper Industries, and no action is needed to reduce current risks. All of the alternatives, except No Action, would be protective in the long term, since wells would be monitored, and MCLs would be achieved within several years. Additionally, institutional controls on the use of ground water on the lot containing the plume were required by the first ROD for the fill area. It is possible that by the time treatment alternatives were constructed at great expense, ground water contamination might already be below MCLs or even detection levels. Additionally, the complex nature of the mine pool would pose a substantial challenge to successful remediation.

Alternative HCB1 is not protective because it would not require continued monitoring of these aquifers which feed the Grove City municipal wells. HCB2 is protective because it would require monitoring. Monitoring is necessary because contaminants are present at very low levels.

B. Compliance with Applicable or Relevant and Appropriate Requirements (ARARS)[2]

[2] Under Section 121(d) of CERCLA, 42 U.S.C. § 9621 (d), and EPA guidance, remedial actions at CERCLA sites must attain legally applicable or relevant and appropriate federal and promulgated state environmental standards, requirements, criteria and limitations which are collectively referred to as "ARARs", unless such ARARs are waived under Section 121(d)(4) of CERCLA, 42 U.S.C. § 9621(d)(4).

Any cleanup alternative considered by EPA must comply with all applicable or relevant and appropriate federal and state environmental requirements. *Applicable* requirements are those substantive environmental standards, requirements, criteria, or limitations promulgated under federal or state law that are legally applicable to the remedial action to be implemented at the Site. *Relevant and appropriate* requirements, while not being directly applicable, address problems or situations sufficiently similar to those encountered at the Site that their use is well-suited to the particular site.

The following Chemical Specific ARAR is relevant and appropriate. Both the federal and state Safe Drinking Water Acts set minimum standards called Maximum Contaminant Levels (MCLs) for drinking water supplied by municipal wells. These MCLs are enforceable federal standards. In addition, EPA attempts to achieve if possible, non-zero Maximum Contaminant Level Goals (MCLGs). These goals are usually lower levels than MCLs.

The Clarion/Mine void, Homewood, Connoquenessing and Burgoon Aquifers are considered Class II aquifers and as such, non-zero MCLs and MCLGs are ARARs. Neither the non-zero MCLGs and MCLs are exceeded in the Homewood, Connoquenessing, or Burgoon Aquifers; However both are exceed in the Clarion Aquifer/Mine Void formation. The No Action alternative would not comply with the state standards as set forth in (25 PA Code, Chapter 109 Subchapter B) Or the federal standards (40 C.F.R. Part 141.61). All other alternatives would comply with this ARAR, since MCLs/Non-zero MCLGs would be achieved in a relatively short time frame.

PADEP has identified Act II as as an ARAR for this remedy; EPA has determined that Act II does not , on the facts and circumstances of this remedy, impose any requirements more stringent than the federal standard.

None of the alternatives would discharge water from the site and therefore there are no discharge ARARs.

The following action specific ARAR is applicable for Alterntives CM-4 and CM-5. Alternatives CM-4 and CM-5 would have air emissions from a carbon adsorption system which would comply with the requirements set forth in 25 PA Code Section 127.12(a)(5), which requires that emissions be reduced to a minimum through Best Available Technology as defined in 25 PA Code Section 121.1. These alternatives would also comply with RCRA requirements of Subpart AA (Air Emission Standards for Process Vents) of the Federal RCRA regulations, 40 C.F.R. 264.1032 are relevant and appropriate for the air emissions control units used by CM-4 and CM-5. Under this ARAR, total organic emissions from the carbon adsorbers must be less than 1.4 kg/hr (3 lb per hour) and 2800 kg/yr (3.1 tons per year). These alternatives would also comply with the TBC OSWER Directive 9355.0-28 which requires control of hydrocarbon emissions in excess of 15 pounds per day in ozone non-attainment areas.

The following action specific ARAR is applicable for Alternatives CM-4 and CM-5. Alternatives CM-4 and CM-5 would produce treatment residuals (spent carbon) that must be managed as a RCRA hazardous waste. A scoping estimate of the amount of carbon disposed is about four tons per year. These residuals must be managed in compliance with the applicable sections of the PA Solid Waste Management Act, 35 P.S. Sections 6018.101 through 6018.1003, which follow: 25 PA Code Part 262 Subparts A (relating to hazardous waste determination and identification numbers), B (relating to manifesting requirements for off-site shipments of spent carbon and other hazardous wastes), C (relating to pre-transportation of hazardous waste requirements), and with respect to operations at the Site generally, with the substantive requirements of 25 PA Code 264 Subparts B-D, I (in the event that hazardous waste generated as part of the remedy is managed in containers) , J (in the event that hazardous waste is managed, treated or stored in tanks). These alternatives will also comply with the RCRA Land Disposal Restrictions set forth at 40 C.F.R. Part 268.1 to 268.5 related to the management of hazardous wastes (including spent carbon) generated as part of the remedial action.

The following action specific ARARs are relevant and appropriate for all alternatives except No Action. All of the alternatives evaluated except the No Action alternatives will comply with 25 PA Code chapter 107 if wells are installed. Alternatives which require reinjection of treated water will meet the requirements of Class IV injection wells under the Safe Drinking Water Act as set forth in C.F.R. 144.13 (c) (provisions related to CERCLA cleanups) and C.F.R. 144.23(b)(1) (injection well closure requirements).

C. Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives CM1, CM2, CM4 and CM5 will not reduce the toxicity mobility or volume of vinyl chloride by treatment. CM3 would reduce the toxicity of the vinyl chloride, however the concentration levels are already low and declining.

Alternatives HCB1 and HCB2 will not reduce the toxicity, mobility or volume of ground water contaminants, however all contaminants were well below safe levels.

D. Implementability

This evaluation criterion addresses the difficulties and unknowns associated with implementing the cleanup technologies associated with each alternative, including the ability and time necessary to obtain required permits and approvals, the availability of services and materials, and the reliability and effectiveness of monitoring.

Alternative CM2 is easily implemented because it only includes monitoring. Alternatives CM3 through CM5 can easily be constructed using established technologies. The ability of Alternatives CM3 and CM4 to achieve cleanup levels much sooner than natural attenuation is questionable. Air sparging would be difficult to effectively implement because the mine tunnels and collapsed mines would produce a very non-uniform delivery of air to the mine pool and the pore water of the Clarion sandstone. Some areas might be cleaned up quickly while other large areas might only progress toward MCLs through natural attenuation. Delivery of nutrients and oxygen to all areas of the mine pool and the Clarion sandstone would pose similar problems.

Both alternatives HCB1 and HCB2 can be easily implemented.

E. Short-Term Effectiveness

If a new residential well were installed and used in the property above the plume, the users could be exposed to contaminants above MCLs. However, except for the Eickmann property, the plume is confined to the property of the current Site owner, who is a respondent to a Unilateral Order issued under the first ROD for OU1 which prohibits placement of new residential wells within one half mile of the site. Another short-term risk associated with the Clarion Formation alternatives is the potential risk associated with air discharges of vinyl chloride during air sparging under CM-4. This risk would be mitigated by the use of off-gas treatment such as carbon. Alternatives CM3 through CM5 would impact farming because wells or trenches must be installed in the field for construction of these alternatives. Alternative CM2 could begin upon approval by EPA and installation of one monitoring well, providing additional confidence that concentrations have declined. Alternatives CM3 through CM5 will require approximately one year to design and Alternatives CM3 and CM4 would require a pilot study.

The Homewood, Connoquenessing and Burgoon Alternative HCB-2 has good short term effectiveness because existing monitoring wells could be used to quickly verify that contaminants are below MCLs. Alternative HCB1 would not be effective in the short term since no monitoring would be conducted.

F. Long-term Effectiveness and Permanence

With all the alternatives, future use of the Clarion Aquifer or mine void system within the plume prior to achieving MCLs would result in health risks. However, with the presence of the water line and the decline of contaminants, the risk is very low. MCLs are based on a 30 year exposure time and EPA expects contaminant levels to reach MCLs within five years. Once cleanup levels are reached there should be no unacceptable residual risks. All alternatives include monitoring after cleanup levels are reached to insure levels remain below cleanup levels.

The contaminant levels in the Homewood, Connoquenessing and Burgoon Aquifers are within safe levels. Alternative HCB2 requires ground water monitoring which will assure that contaminants remain below safe levels for several years, after which monitoring may be discontinued. Alternative HCB1 is not considered to have good long term effectiveness because it would not verify that ground water contamination is not present over the next several years.

G. Cost

Evaluation of costs of each alternative generally includes the calculation of direct and indirect capital costs and the annual operation and maintenance (O&M) costs, both calculated on a present worth basis.

Direct capital costs include costs of construction, equipment, building and services, and waste disposal. Indirect capital costs include engineering expenses, start-up and shutdown, and contingency allowances. Annual O&M costs include labor and material; chemicals, energy, and fuel; administrative costs and purchased services; monitoring costs; costs for periodic site review (every five years); and insurance, taxes, and license costs. For cost estimation purposes, a conservative period of ten years has been used for O&M for Natural Attenuation with monitoring. The actual cost for each alternative is expected to be in a range from 50 percent (50%) higher than the costs estimated to 25 percent (25%) lower than the costs estimated. The evaluation was based on the FS cost estimates.

CM2 is the least costly remedial action which is protective of human health and the environment. HCB2 is more costly than HCB1, but HCB1 is not considered by EPA to be sufficiently protective of human health and the environment. The approximate costs of the Clarion and Homewood Aquifer Alternatives are given below:

TABLE - 6 - CLARION AQUIFER ALTERNATIVE COSTS

Alternative	Capital Cost	Yearly O&M Cost (1996 Dollars)	Present Worth
CM1	$0	$0	$0
CM2	$37,000	$38,400	$349,000
CM3	$1,359,000	$117,000	$1,830,000
CM4	$1,362,000	$73,400	$1,910,000
CM5	$854,000	$119,500	$1,349,000

TABLE -7 - DEEP AQUIFER ALTERNATIVE COSTS

Alternative	Capital Cost	Yearly O&M (1996 Dollars)	Present Worth
HCB1	$0	$0	$0
HCB2	$0	$22,800	$82,600

H. State Acceptance

The Commonwealth of Pennsylvania has had the opportunity to review and comment on all the documents in the Administrative Record and has participated in selecting the remedy for this Site. The State has had the opportunity to comment on the draft ROD and, to the extent possible, the Commonwealth's comments have been incorporated into the ROD. The Commonwealth has concurred with this ROD.

I. Community Acceptance

The community has concerns about the alternative selected in this ROD. Oral and written comments on the remedial alternatives evaluated by EPA for the implementation at the Site are included in Part III of this ROD.

X. SELECTED REMEDY AND PERFORMANCE STANDARDS

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives using the nine criteria, and public comments, EPA has selected Alternatives CM2 - Natural Attenuation with monitoring and HWCB2 - Natural Attenuation with monitoring to address the remaining ground water contamination at the Site.

CM2-Natural Attenuation with Monitoring: This alternative includes monitoring existing and new monitoring wells to track the continuing natural attenuation of vinyl chloride and other VOCs in the ground water. Monitoring of water quality would be performed using EPA method 524.2 for five years after MCLs are reached.

Rationale: Monitoring of the Clarion Aquifer and mine void system has shown that contaminant concentrations have been decreasing with time, and would likely achieve cleanup levels established by the risk assessment in five years or less without active remediation. As explained on page 16 under Extent of Contamination, vinyl chloride is a gas above 7 degrees Farenheit, and is almost certainly due to the degradation of trichloroethylene. This is strong evidence of biological or chemical processes which are degrading chlorinated solvents. Additionally, trends showing the decline in vinyl chloride also support the conclusion that natural attenuation is occurring. The range of concentrations in monitoring wells in the mine void was about 1 - 5 ppb. Only the Eickman well showed higher concentrations (5-10 ppb). Concentrations are above the MCL (2 ppb), but not dramatically. A water line has made public water available to residents near the contamination plume and with the exception of the Kring and Parker wells, the residents have connected to the public water supply including the Eickmann residence.

Additionally, a slurry wall, geocomposite cap and a leachate treatment system have been completed to isolate the fill material in the landfill, preventing further leaching into the adjacent aquifer. Monitoring wells in the Clarion and Homewood Aquifers will assure that unexpected leaching from the landfill does not occur undetected. The injection wells were purposely placed between the plume and residents to the east to avoid moving the contaminant plume towards the east. Only the contamination in the Eickman well area is to the east of the injection system. Additionally, the amount of water injected is small compared to the volume of the mine pool and should not significantly change its flow pattern. The extensive well sampling described below will monitor the Clarion ground water to make sure that residential wells are not impacted and that the contamination continues to decline. If contaminant levels do not continue to decline, or if they increase, or if additional residential wells are contaminated, EPA in consultation with the PADEP will determine what addional action is needed to protect the public.

Performance Standards: Ground water monitoring shall consist of sampling four wells in the mine void on a quarterly basis (MWV-4, MWV-6, MWV-7 and MWV-8). Six wells in the Clarion Aquifer shall be monitored semi-annually (MWC-2, MWC-3, MWC-4, MW-7, MW-8, and MW-9). Nine wells in the mine void system shall be monitored semi-annually (MWV-1 through MWV-8). One new monitoring well (MWV-9) shall be installed in the mine voids to supplement the existing network. The wells sampled shall monitor the boundary of the plume and monitor both migration and attenuation of the contamination. If sampling results indicate, as determined by EPA and the PADEP, that the plume is not bounded by the current well system, EPA shall require the installation of additional wells. In addition, two residential wells (the Kring and Parker wells), shall be monitored quarterly. The ground water samples shall be analyzed for low level TCL VOCs with results summarized in annual reports. The wells sampled shall be located at the boundary of the plume and within the plume to monitor both migration and attenuation of the contamination. Ground water elevations shall be taken during each sampling event to make sure that ground water flow directions do not change significantly.

Monitoring must continue for five years after MCLs and non-zero MCLGs are reached.

During the public meeting, the public expressed strong concerns that no residential wells except the Eickmann well have been sampled since 1994, and that some low risk wells had not been sampled since 1993. After consideration of public comments, EPA agrees that the initial round of residential well sampling required above shall include all of the wells previously sampled, if the well is still open and if the resident agrees to the sampling of their well. The initial round of sampling shall include the following residential wells if possible: Rodgers, Orr, Briggs, Dinninger, McDougal, Donnelly, Hunter, Perry, Stillwagon, Dunn, Bennet, Lazor, Hinds, Eickmann, Kring, and Grande. After this initial sampling event, a subset of these residential wells consisting of residential wells (8 wells) not using the public water line will be sampled annually until MCLs are met in the contaminant plume if the resident agrees to the sampling of their well. This adds a one time initial expense of about $6,000, an annual O&M increased cost of about $3,200 and a total present worth increase of about $40,000. The revised costs for this remedy are:

CM2 - Capital Cost - $43,000, Yearly O&M Cost - $41,600, PW Cost- $388,700.

Alternative HCB2 - Natural Attenuation with Monitoring: This alternative includes monitoring of existing wells in the Connoquenessing, and Burgoon Aquifers to verify contamination is not migrating from the Site toward community wells. Monitoring of water quality would be performed using standard methods that are routine and widely accepted.

Rationale: Although site related contaminants were not found in the Homewood, Connoquenessing or Burgoon Aquifers during the focused RI, sporadic low levels of contamination were found in these aquifers during the Remedial Investigation completed in 1988. Additionally, EPA considered the fact that the site has been disturbed by construction activities and ground water flow patterns in the shallow aquifer will change somewhat because of the presence of the slurry wall. EPA believes that it is prudent to monitor these wells which are between the Site and the Grove City Municipal wells for a limited time to make sure that the aquifers remain clean. The purpose of these wells is to monitor for an unexpected release and a resultant contaminant plume. These wells are a significant distance from the site (one quarter to one half mile northwest) and are located in the township right of way along roads. Therefore, EPA would not be surprised to trace levels of contaminants such as gasoline or oil components below MCLs in the ground water from these wells as the result of activities unrelated to the site. The purpose of these wells is is primarily to monitor for an unexpected contaminant plume of VOCs, and the presence of trace levels of oil or gasoline components below MCLs would not preclude discontinuing monitoring at the end of three years.

Performance Standards: Ground water monitoring shall consist of sampling three wells in the Connoquenessing Aquifer and three wells in the Burgoon Aquifer for three years on a semi-annual basis to confirm past monitoring results. This alternative includes monitoring of existing wells in the Connoquenessing (CW-1, CW-2, and CW-3) and Burgoon (BW-1, BW-2, and BW-3) Aquifers to verify contamination is not migrating from the Site toward community wells. Monitoring of water quality would be performed using EPA method 524.2 . The samples will be analyzed for low level TCL VOCs with results summarized in annual reports. Ground water levels shall be taken at each sampling event. If site related contaminants are not found in the wells during the three year period, the wells shall be closed. If site related contaminants are found during this period, EPA in consultation with the PADEP will determine at that time, what additional sampling needs to be conducted or if additional action is warranted.

Wetland Sediments - No Action - Studies showed that the wetlands to the southwest of the landfill had not been impacted and EPA's has determined that no action is required.

XI. STATUTORY DETERMINATIONS

This remedy satisfies the remedy selection requirements of CERCLA and the NCP. The remedy is expected to be protective of human health and the environment, complies with ARARs, is cost effective, and utilizes permanent solutions to the maximum extent possible. The following is a discussion of how the selected remedial action addresses the statutory requirements.

A. Overall Protection of Human Health and the Environment

The selected alternatives provide overall protection of human health and the environment because there are no residents using contaminated ground water. The Record of Decision for the first Operable Unit prevents new wells on the property containing the plume. In accordance with this previously issued ROD, EPA will place a temporary deed restriction on the use of ground water on the property containing the plume until the ground water reaches MCLs. The Grove City water line was extended around the perimeter of the Site by Cooper Industries, and no action is needed to reduce current risks. There is currently no development occurring on the land over the plume. Additionally, the slurry wall, geo-composite liner cap and leachate treatment system has contained the source of ground water contamination. Since the source is contained, EPA expects the decline in ground water contamination to continue. EPA will continue to monitor the Clarion, Homewood, Connoquenessing and Burgoon Aquifers to make sure that ground water contamination levels reach MCLs in the Clarion Aquifer and remain below MCLs in all of the studied aquifers.

B. Compliance with Applicable or Relevant and Appropriate Requirements (ARARS)

The selected alternatives will comply with the state standards as set forth in (25 PA Code, Chapter 109 Subchapter B) and the federal standards (40 C.F.R. Part 141.61) (MCLs/Non-zero MCLGs would be achieved in a relatively short time frame). PADEP has identified Act II as an ARAR for this remedy; EPA has determined that Act II does not, on the facts of the circumstances of this remedy, impose any requirements more stringent than the federal standard.

The selected alternatives will comply with 25 PA Code chapter 107 for well installation.

C. Cost Effectiveness

The selected remedy is the most cost effective alternative which adequately protects public health and the environment. The only alternative which would cost less is no action without monitoring.

The only capital cost associated with the selected alternative for the Clarion Aquifer is for the installation of one additional monitoring well. This cost is expected to be approximately $43,000 including a one time expanded residential well sampling event. The annual cost for ground water monitoring is approximately $41,600. The present worth cost of this alternative is estimated at $388,000 for ten years of monitoring. The time period on degradation rates indicate that vinyl chloride should meet MCLs in about five years. Detailed cost information is shown on Table 4-1 of the FS.

There is no capital cost associated with continued monitoring of the deep aquifers at the Site. The annual O&M cost for ground water monitoring and well maintenance is approximately $22,800 and the present worth cost is $82,600.

The approximate present worth cost of both monitoring programs for ten years and the expanded residential sampling is about **$471,000**. If the contaminant concentrations decline as fast as expected, the cost would be much less.

D. Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and alternative treatment technologies can be utilized in a cost-effective manner at the Site. EPA expects ground water to be permanently restored to below MCLs in a relatively short time frame (five years or less).

E. Preference for Treatment as a Principal Element

There were no cost effective remedial alternatives which used treatment as a principle element. EPA expects ground water natural attenuation to reduce contaminants to near or below MCLs by the time the alternatives with treatment as a principle element could be employed.

XII. DOCUMENTATION OF SIGNIFICANT CHANGES

During the public meeting, residents were concerned that EPA had not sampled residential wells recently, and residents supported a more extensive residential sampling program than the one described in the Feasibility Study. EPA has considered public comments and EPA agrees that a one time comprehensive resampling event is appropriate and additionally, that some additional residential wells not using public water should be sampled annually. If new contamination is not found, it is unlikely that new residential wells will be contaminated in the future, considering the decline in contamination in the Clarion Aquifer, and the fact that a source control measure is in place.

APPENDIX A

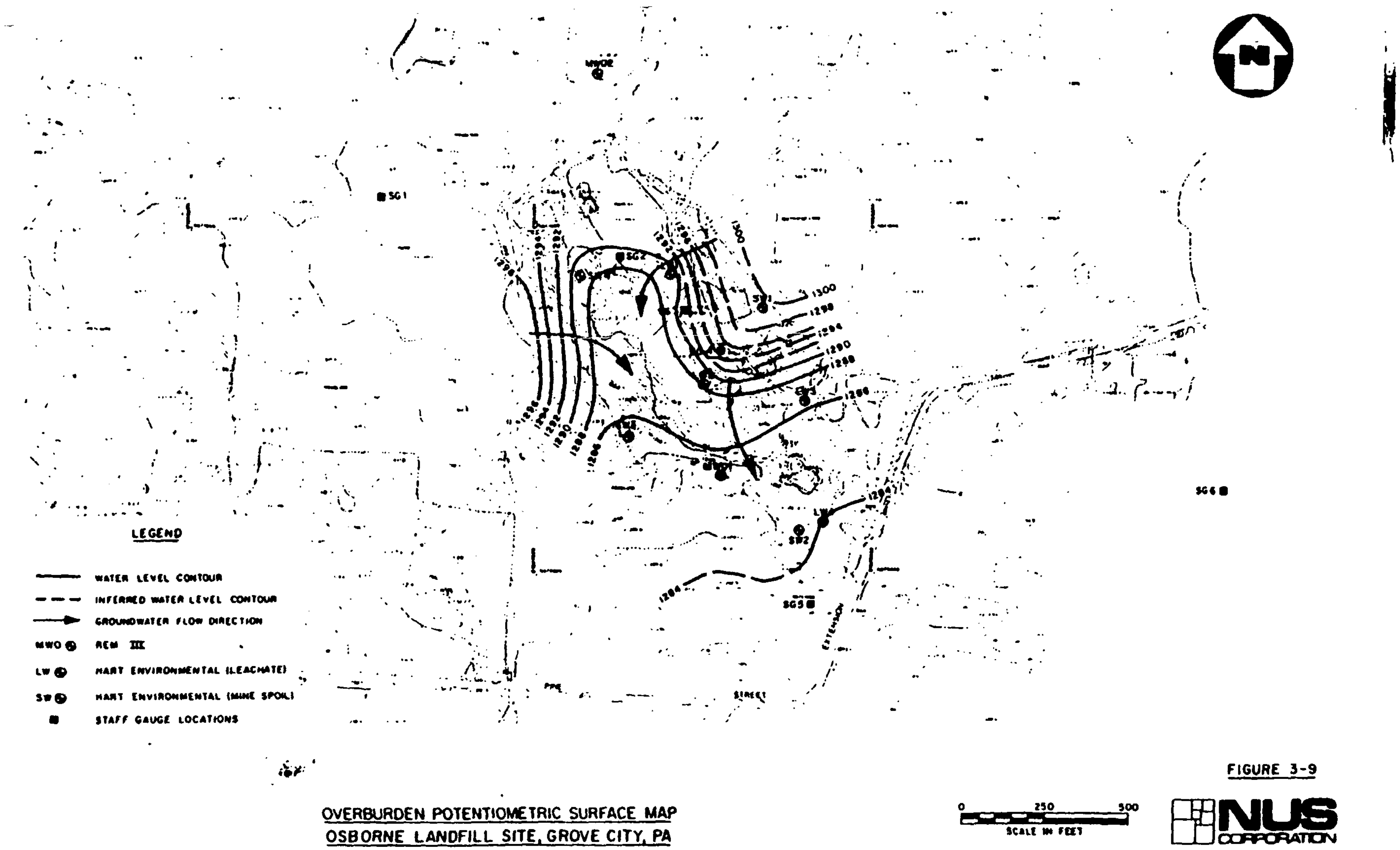


FIGURE 3-9

OVERBURDEN POTENTIOMETRIC SURFACE MAP
OSBORNE LANDFILL SITE, GROVE CITY, PA
8/30/88

NUS CORPORATION

FIGURE 3-10

OVERBURDEN POTENTIOMETRIC SURFACE MAP
OSBORNE LANDFILL SITE, GROVE CITY, PA
2/21/89

0 250 500
SCALE IN FEET

NUS CORPORATION

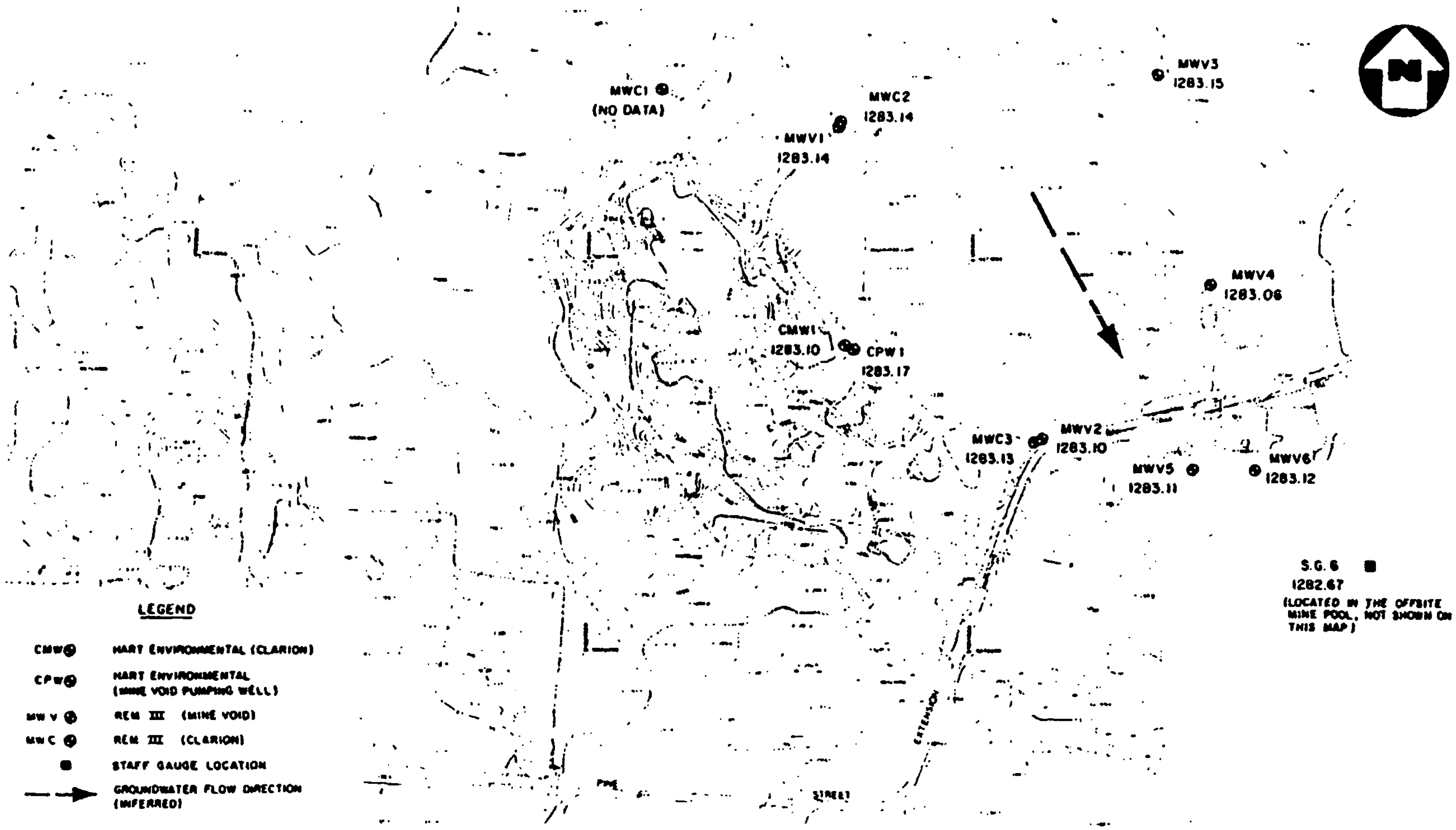
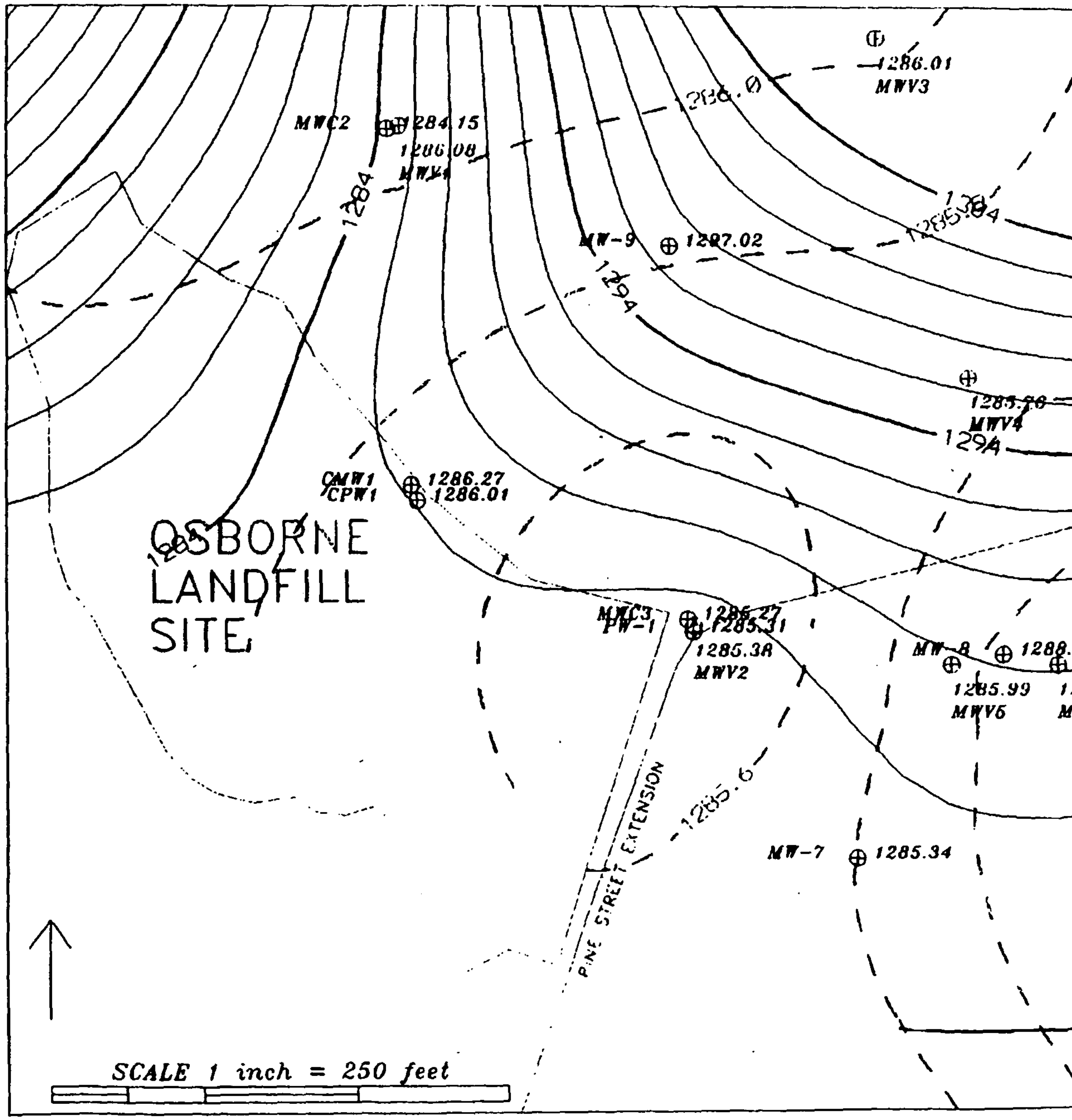


FIGURE 3-11

CLARION FORMATION/MINE VOID WATER LEVEL ELEVATIONS
OSBORNE LANDFILL SITE, GROVE CITY, PA
3/3/89

0 250 500
SCALE IN FEET

NUS CORPORATION



CLARION AQUIFER

⊕ Monitoring Well
1295.46 Water level, ft msl
Contour interval = 2 ft

BROOKVILLE COAL

⊕ Monitoring Well
1295.46 Water level, ft msl
Contour interval = 0.2 ft

Water levels for January 1993

Figure 4-1
Piezometric Surfaces

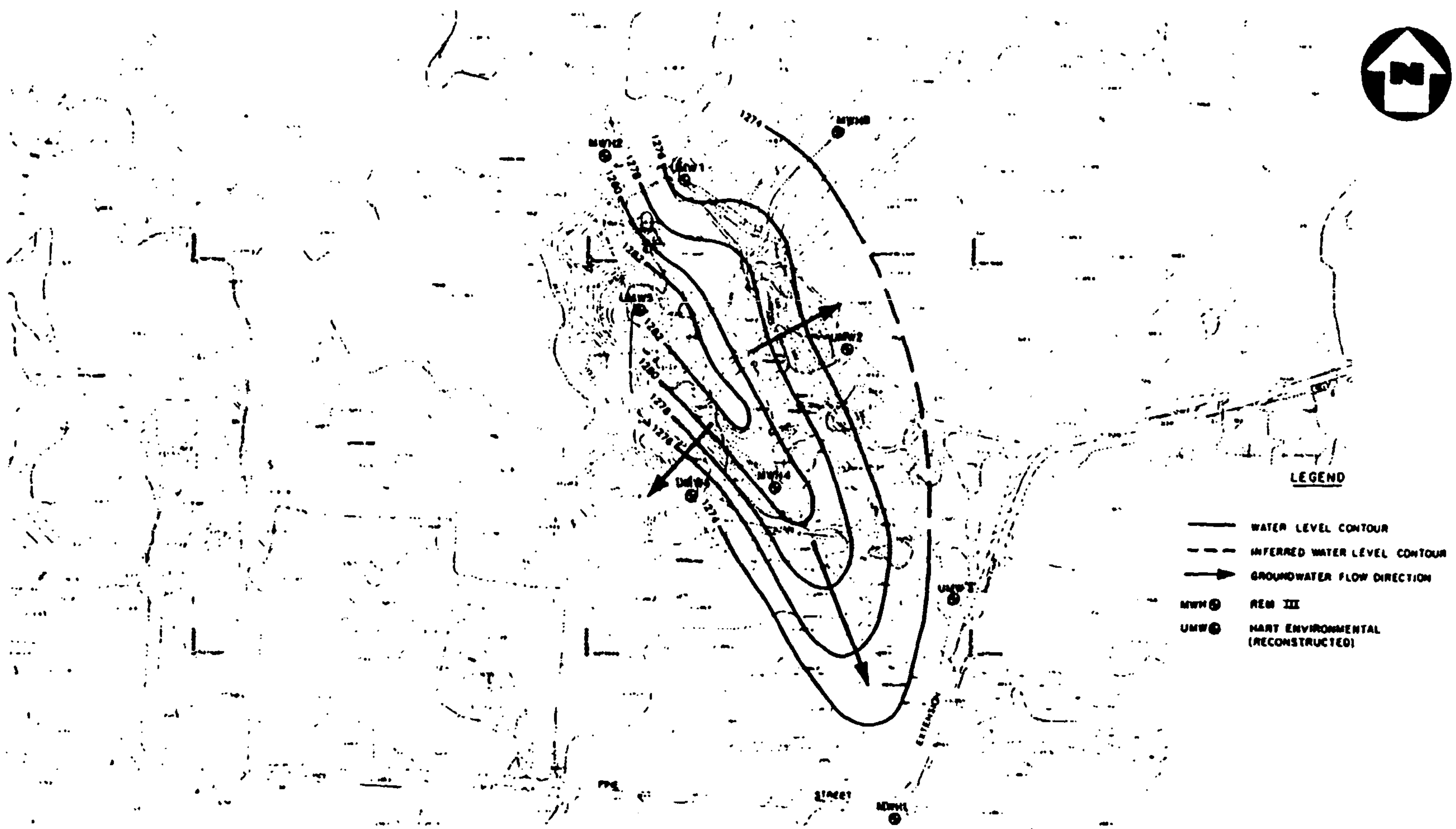


FIGURE 3-12

HOMEWOOD FORMATION POTENTIOMETRIC SURFACE MAP
OSBORNE LANDFILL SITE, GROVE CITY, PA
8/30/88

SCALE IN FEET

NUS CORPORATION

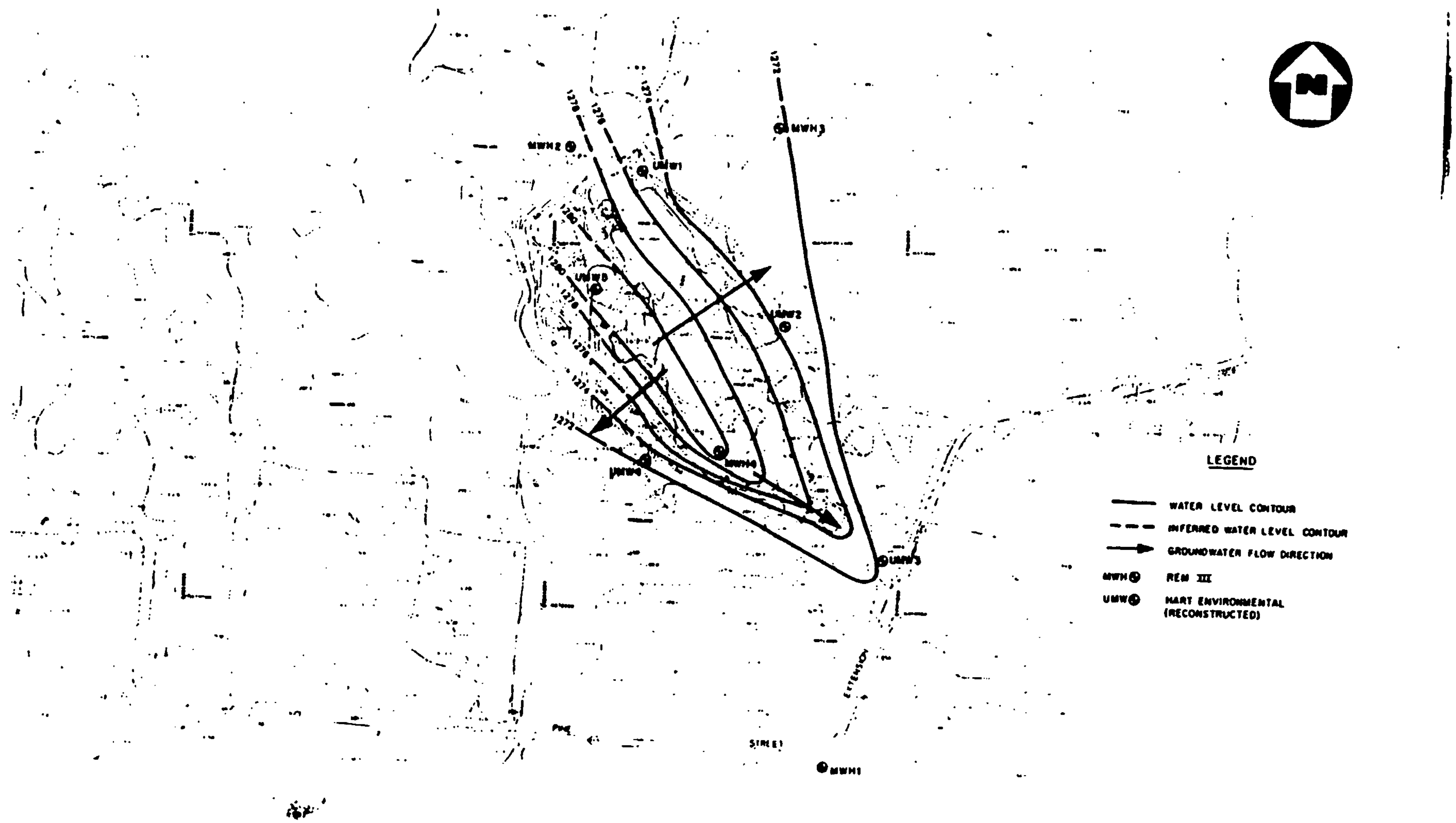


FIGURE 3-13

HOMEWOOD FORMATION POTENTIOMETRIC SURFACE MAP
OSBORNE LANDFILL SITE, GROVE CITY, PA
10/20/88

NUS CORPORATION

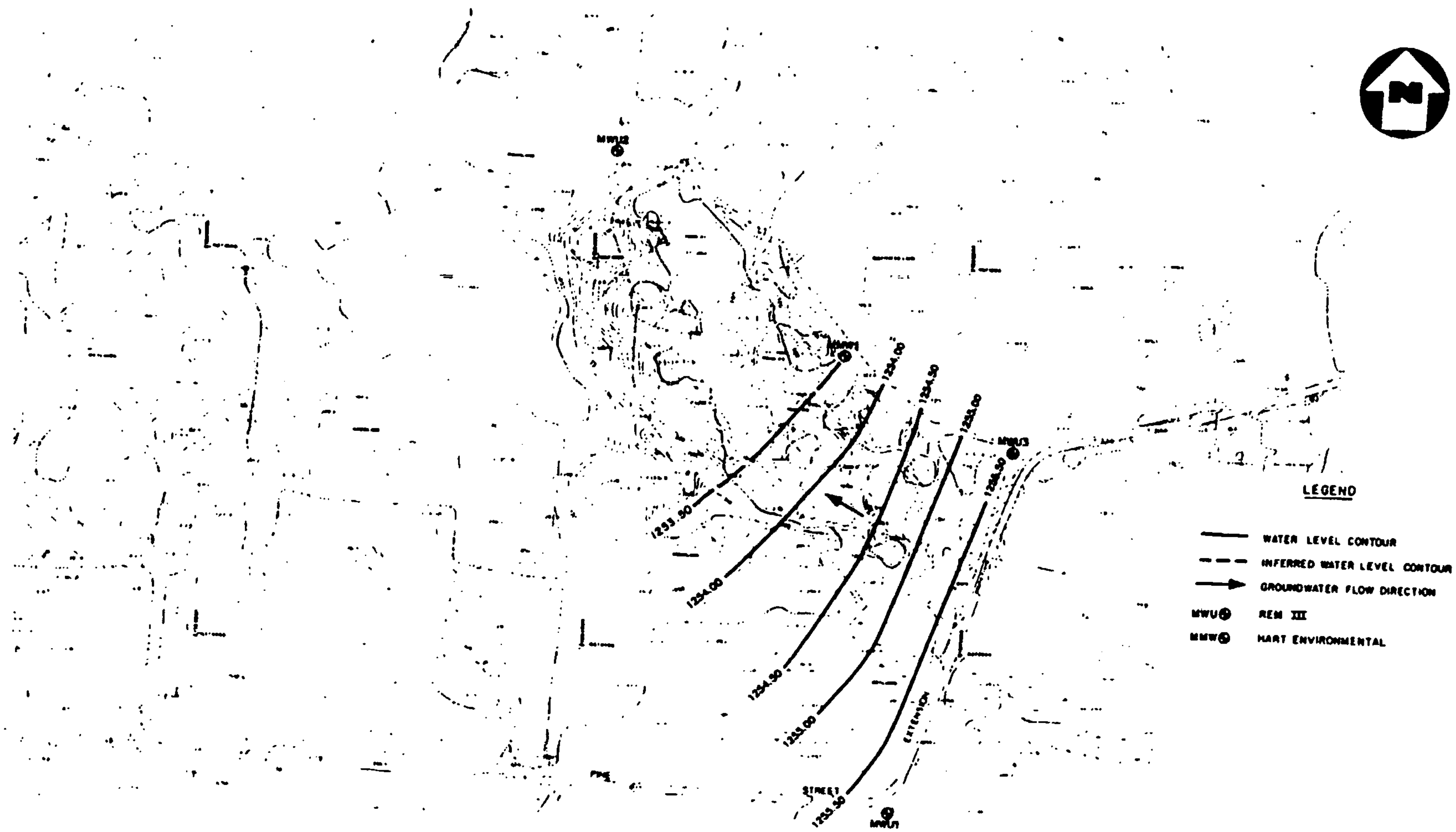


FIGURE 3-16

CONNOQUENESSING FORMATION POTENTIOMETRIC SURFACE MAP
OSBORNE LANDFILL SITE, GROVE CITY, PA
8/30/88

0 250 500
SCALE IN FEET

NUS CORPORATION

FIGURE 3-17

CONNOQUENESSING FORMATION POTENTIOMETRIC SURFACE MAP
OSBORNE LANDFILL SITE, GROVE CITY, PA
10/20/88

SCALE IN FEET

NUS CORPORATION

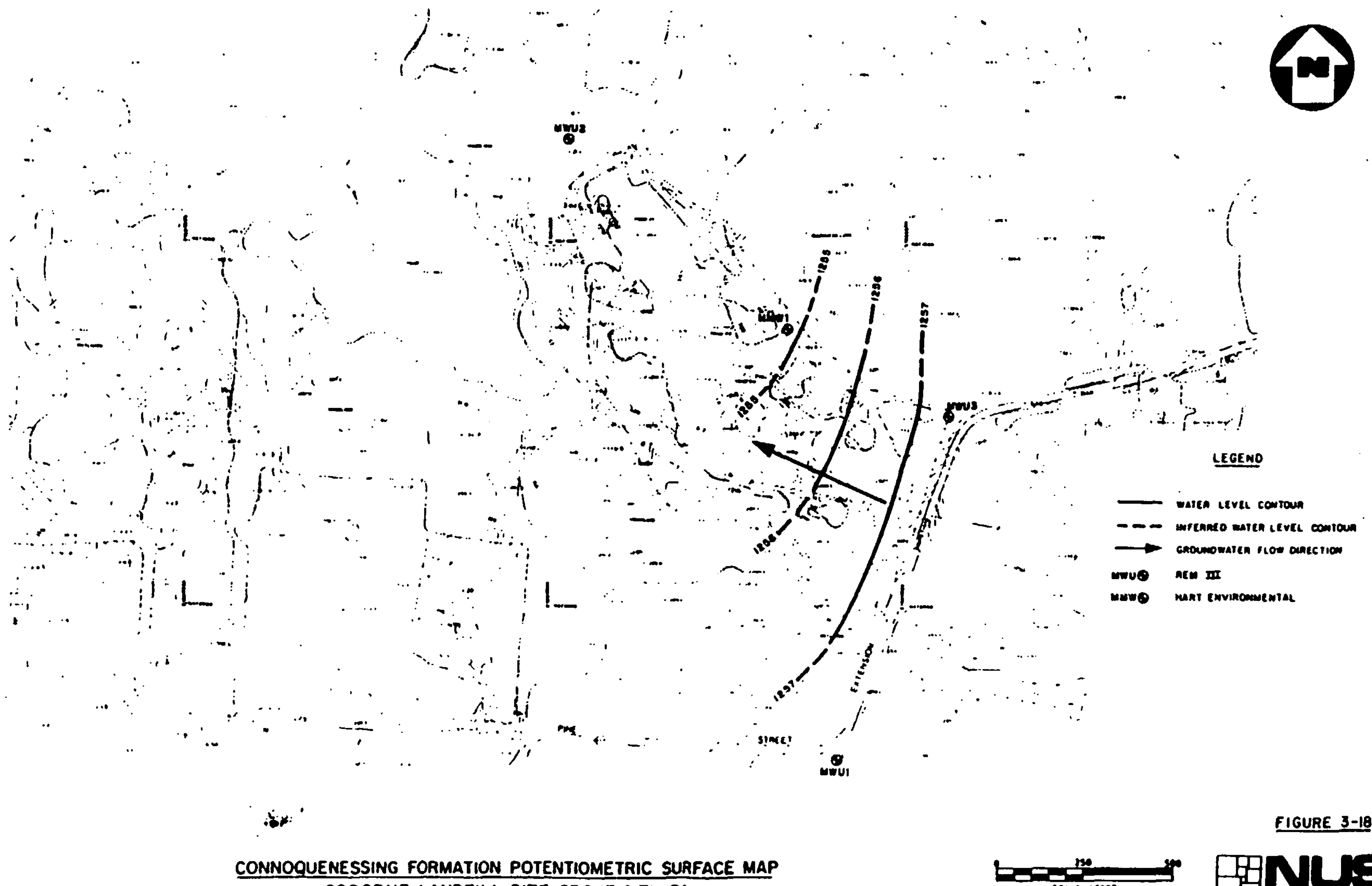


FIGURE 3-18

CONNOQUENESSING FORMATION POTENTIOMETRIC SURFACE MAP
OSBORNE LANDFILL SITE, GROVE CITY, PA
2/21/89

NUS CORPORATION

FIGURE 3-19

BURGOON FORMATION POTENTIOMETRIC SURFACE MAP
OSBORNE LANDFILL SITE, GROVE CITY, PA
8/30/88

NUS CORPORATION

FIGURE 3-21

BURGOON FORMATION POTENTIOMETRIC SURFACE MAP
OSBORNE LANDFILL SITE, GROVE CITY, PA
2/21/89

0 250 500
SCALE IN FEET

NUS CORPORATION

FIGURE 3-20

BURGOON FORMATION POTENTIOMETRIC SURFACE MAP
OSBORNE LANDFILL SITE, GROVE CITY, PA
10/20/88

NUS CORPORATION

APPENDIX B

GLOSSARY OF ENVIRONMENTAL TERMS

Code of Federal Regulations (CFR): Document that codifies final regulations having general applicability and legal effect that have previously appeared in the Federal Register.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A Federal law passed in 1980 that established Federal authority for responding to the release of hazardous substances into the environment including creating a Federal fund to finance responses and imposing liability for releases on the responsible parties. CERCLA was amended in 1986 by the Superfund Amendments and Reauthorization Act.

Final Close Out Report: A 'stand alone' report documenting compliance with the statutory requirements of CERCLA and providing a consolidated record of all remedial activities at all of a site's operable units.

Final Pollution Report (POLREP): The document that signifies that a removal has been completed (i.e., when all objectives outlined in the Action Memorandum and any addenda, such as removal and transport of wastes off site, waste disposal, and demobilization have been accomplished).

Hazard Ranking System (HRS): A scoring system developed as part of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) used to evaluate potential relative risks to public health and the environment from releases or threatened releases of hazardous substances. EPA and States use the HRS to calculate a site score based on an actual or potential release of hazardous substances from a site through air migration, surface water migration, groundwater migration, or soil exposure pathways. This score is used to decide if a hazardous waste site should be placed on the National Priorities List (NPL).

Hazardous Substance: Under CERCLA section 101(14), any element, compound, mixture, solution, or substance that, when released to the environment, may present substantial danger to public health/welfare or the environment. The term also includes substances designated as hazardous or toxic under the Clean Air Act, the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1986, the Resource Conservation and Recovery Act, as amended and the Toxic Substances Control Act. The term does not encompass petroleum, including crude oil, natural gas, liquids, liquefied natural gas, or synthetic gas usable for fuel.

Local Notice of Intent to Delete: A notice published in a local newspaper of general circulation, announcing the Agency's intent to delete a site from the NPL. It also announces a 30-day public comment period, among other things, and identifies the location of the local repository.

Long-Term Response Action (LTRA): A site that requires a long, continuous period of on-site activity before the cleanup levels specified in the ROD are achieved.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): The regulation for Federal response actions under CERCLA, commonly referred to as the National Contingency Plan, or NCP. The NCP sets forth the Hazard Ranking System and establishes procedures and standards for responding to releases of hazardous substances. The plan has been codified in Title 40 CFR Part 300.

National Priorities List (NPL): EPA's list of the most serious uncontrolled hazardous waste sites identified for possible long-term remedial response. This list is based primarily on the score a site receives on the Hazard Ranking System. EPA is required to update the NPL at least once a year.

Notice of Deletion (NOD): A notice published in the Federal Register announcing a site's deletion from the NPL.

Notice of Intent to Delete (NOID): A notice published in the Federal Register announcing the Agency's intent to delete a site from the NPL. This notice provides information about the site and associated cleanup activities, and provides the public with a 30-day public comment period.

Operable Unit (OU): A term for each of a number of discrete activities undertaken as part of a Superfund site cleanup. An example of an operable unit would be removing drums and tanks from a surface of a site.

Operation and Maintenance (O&M): Activities conducted at a site after a Superfund site action is completed to ensure that the action is effective and operating properly.

Potentially Responsible Party (PRP): Any individual(s) or company(s) (such as owner, operator, transporter, or generator) potentially responsible for, or contributing to, contamination at a CERCLA site. Whenever possible, EPA requires PRPs, through administrative and legal actions, to clean up hazardous waste sites that they have contaminated.

Preliminary Assessment (PA): The process of collecting and reviewing existing information about a known or suspected hazardous waste site or release. EPA uses this information to determine if the site requires further study. If further study is needed, a site inspection is performed.

Preliminary Close Out Report: A report, documenting the completion of the physical remedy construction at a site, that is prepared after work at the final operable unit is complete. To name a few, it summarizes the release at the site, site conditions, construction activities, and any response actions.

Quality Assurance/Quality Control (QA/QC): A system of procedures, checks, audits, and corrective actions to ensure that all EPA research design and performance, environmental monitoring and sampling, and other technical reporting activities are of the highest achievable quality.

Record of Decision (ROD): A public document that explains which cleanup alternative(s) will be used at National Priorities List sites. The ROD is based on information and technical analysis generated during the remedial investigation/feasibility study and consideration of public comments.

Remedial Action (RA): Taken instead of or in addition to a removal action, a remedial response is the permanent remedy taken at a site; it seeks to prevent or minimize the release of hazardous substances and to prevent further migration. Remedial actions may include storage, confinement, perimeter protection, neutralization, cleanup, recycling, repair of leaking containers, bioremediation, and incineration.

Remedial Action Report: The Remedial Action Report documents the activities that occur under each specific remedial action operable unit at a site. It also provides documentation that a particular operable unit has met its objectives, and certifies that all items in the settlement agreement and any incorporated documents have been met.

Remedial Design (RD): A phase of remedial action that follows the remedial investigation/feasibility study and includes development of engineering drawings and specifications for a site cleanup.

Remedial Investigation/Feasibility Study (RI/FS): Two distinct but related studies. They are usually performed at the same time, and together are referred to as the RI/FS. They are intended to: (1) gather the data necessary to determine the type and extent of contamination at a CERCLA site listed on the National Priorities List; (2) establish criteria for cleaning up the site; (3) identify and screen cleanup alternatives for remedial action; and (4) analyze in detail the technology and costs of the alternatives.

Remedial Project Manager (RPM): The EPA or state official responsible for overseeing remedial action at a site.

Removal Action (RA): The cleanup or removal of released hazardous substances from the environment or the taking of other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare when immediate action is considered to be necessary. In addition to physically removing hazardous substances from the site, removal actions may include measures to limit access to the site and the provision of alternative water supplies and temporary housing.

Resource Conservation and Recovery Act (RCRA): An amendment to the Solid Waste Disposal Act, addressing the safe management of the hazardous and non-hazardous municipal and industrial waste generated nationwide. This act governs hazardous waste treatment, storage and disposal facilities, and was amended in 1984 by the Hazardous and Solid Waste Amendments.

Site Inspection (SI): An investigatory phase following a preliminary assessment in which more extensive information is collected through site sampling. The collected information is used to score a site under the Hazard Ranking System to determine whether the site will be placed on the National Priorities List.

Superfund: The common name used for the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended in 1986 and the EPA activities implementing the Act.

Superfund Amendments and Reauthorization Act (SARA): Amendments to CERCLA enacted on October 17, 1986, that expanded the size of the cleanup fund, established cleanup standards and deadlines for response actions, and addressed cleanup of Federal facilities.

Trust Fund: Commonly referred to as "Superfund," this is a fund established by CERCLA to pay for the cleanup of hazardous waste sites and for the costs of legal action necessary to force those responsible for creating the sites to clean them up or pay for clean up costs.

PART III

RESPONSIVENESS SUMMARY
FOR THE
PROPOSED REMEDIAL ACTION PLAN
FOR OU-2, OU-4, AND OU-5
OF THE
OSBORNE LANDFILL SUPERFUND SITE
PINE TOWNSHIP, MERCER COUNTY, PENNSYLVANIA

Public Comment Period
August 6, 1997 through October 9, 1997

Osborne Landfill Superfund Site

TABLE OF CONTENTS

This responsiveness summary is divided into the following sections:

Overview: This section discusses the U.S. Environmental Protection Agency's (EPA) preferred alternatives for the remedial action at the Osborne Landfill Superfund Site (the site).

Background: This section provides a brief history of community relations activities conducted during remedial planning at the site.

Part I: This section provides a summary of commentors' major issues and concerns expressed during the public meeting and EPA's responses to those issues and concerns. "Commentors" may include local homeowners, businesses, the municipality, contractors representing citizen group interests and potentially responsible parties(PRPs).

Part II: This section provides responses to written comments given to EPA at the public meeting.

Part III: This section provides responses to written comments sent to EPA during the comment period.

Overview

On August 6, 1997, EPA announced the opening of the public comment period and published the Proposed Remedial Action Plan (Proposed Plan) for Operable Units (OUs) OU-2 - Wetland Sediment, OU-4 - Clarion Aquifer and Mine Void System, and OU-5 - Homewood, Burgoon, and Connoquessing Aquifers for the Osborne Landfill Superfund Site located in Pine Township, Mercer County, Pennsylvania. The Proposed Plan details EPA's preferred clean-up alternatives to reduce site contamination. In selecting the clean-up alternatives, EPA considered the following nine evaluation criteria:

Threshold Criteria
- Overall protection of human health and the environment
- Compliance with Federal, state, and local environmental and health laws

Balancing Criteria
- Long-term effectiveness and permanence
- Reduction of mobility, toxicity, or volume of contaminants
- Short-term effectiveness
- Ability to implement
- Cost

Modify Criteria
- State acceptance
- Community acceptance

EPA carefully considered state and community acceptance of the clean-up alternatives before reaching the final decision regarding the clean-up plan. The Record of Decision (ROD) details EPA's final clean-up decision.

EPA's preferred clean-up alternatives are outlined below. Based on current information, these alternatives meet the nine evaluation criteria EPA used to evaluate each alternative. EPA selected one alternative for each OU.

OU-2 - Wetland Sediment

EPA required no action for the wetland sediment. Contamination was not found at levels that presented an unacceptable risk to the environment; therefore, EPA did not develop or evaluate alternatives.

OU-4 - Clarion Aquifer and Mine Void System

EPA's preferred alternative is natural attenuation with monitoring. EPA will conduct regular monitoring activities to ensure that contamination concentrations continue to decrease.

OU-5 - Homewood, Burgoon, and Connoquessing Aquifers

EPA's preferred alternative for the Homewood, Burgoon, and Connoquessing Aquifers is natural attenuation with monitoring. EPA determined that the Homewood, Burgoon, and Connoquessing Aquifers are undergoing natural attenuation and have already reached safe levels. Therefore, EPA does not propose to conduct any active ground water treatment.

Background

The Osborne Landfill Superfund Site is one mile east of Grove City, Pennsylvania, and covers approximately 15 acres. Residential homes are located approximately one quarter mile north of the site. Due to ground water contamination, Cooper Industries (Cooper), one of the PRPs for the site, extended the municipal water line to the nearby homes. All of these homes, except one, use the public water supply.

The major concern at the site was approximately 233,000 cubic yards of fill material that was contaminated with metals and volatile organic compounds. The fill material disposed at the site included:

- used sand;
- infilco sludge (sludge settled and collected from hydroblast equipment);
- used carbide (a byproduct consisting of a lime and water slurry);
- waste acids from plating and cleaning tanks;
- processed solvents; and
- miscellaneous debris.

During the 1940s, the site was used for strip mining. After the 1940s, the property owners disposed waste in the former strip mining pool. From the 1950s through 1978, the landfill accepted various types of industrial wastes. After the landfill closed, EPA and the Pennsylvania Department of Environmental Resources (PADER), now known as the Pennsylvania Department of Environmental Protection (PADEP), found many hazardous substances on the site property.

In 1983, EPA placed the site on the National Priorities List. At that time, EPA divided the site into different areas of concern, to make the site more manageable for clean up. The five OUs for the Osborne Site are:

- OU-1 - Fill Material in Strip Pit
- OU-2 - Wetland Sediment
- OU-3 - Leachate
- OU-4 - Clarion Aquifer and Mine Void System
- OU-5 - Homewood, Burgoon, and Connoquessing Aquifers

In August 1989, EPA thoroughly studied the site, assessed the risks of the site to the community, considered possible clean-up actions for the site, and issued a Proposed Plan for OU-1 and OU-3. EPA chose, as its preferred clean-up method, the construction of a hazardous waste landfill on the site to contain the contamination.

After conducting a site investigation in August 1989, EPA and a group of slurry wall experts met and discussed the positive and negative points of constructing a slurry wall to contain the waste as opposed to constructing the planned hazardous waste landfill. The group decided that constructing a slurry wall would be a more appropriate and efficient method to contain the site waste due to conditions at the site.

In 1990, EPA issued a ROD that identified the slurry wall as the preferred clean-up method.

Construction of the landfill was named as a back-up plan. If the slurry wall ever fails, the PRPs are required to construct the landfill to contain the wastes.

After issuing the ROD, EPA negotiated with the PRPs, but could not reach a voluntary agreement to clean up the site. In 1991, EPA ended its attempts to negotiate and legally ordered the PRPs to construct the slurry wall.

In February 1996, EPA mailed a fact sheet to interested citizens identified on an EPA mailing list. The fact sheet discussed construction plans for the site, previous site monitoring, and a general description of current activities at the site.

On August 6, 1997, EPA issued a second Proposed Plan. On the same day, a public notice appeared in the Allied News announcing the Proposed Plan and the upcoming public meeting. On August 25, 1997, EPA held the public meeting at the East Main Presbyterian Church to announce EPA's clean-up methods for OUs 2, 4, and 5, as described in the Proposed Plan. At the August 1997 public meeting, EPA discussed the Proposed Plan and addressed the public's questions and concerns about the clean-up alternatives. EPA distributed a fact sheet at the public meeting that discussed the site history, EPA's preferred clean-up alternatives, and the other alternatives for the site clean up. EPA also sent the fact sheet to interested citizens on EPA's site mailing list.

Due to numerous public comments, questions, and concerns received during the public comment period, EPA extended the comment period for an additional 30 days. Comments and questions about the Proposed Plan are summarized in the following sections of this responsiveness summary.

Part I: Summary of Commentors' Major Issues and Concerns

This section provides a summary of commentors' major issues and concerns expressed at the public meeting and EPA's responses to those issues and concerns. "Commentors" may include local homeowners, businesses, the municipality, and PRPs. The major issues and concerns about the proposed clean-up alternatives for the Osborne Site received during the public meeting on Monday, August 25, 1997, are grouped into the following categories: general site-specific issues, extent of contamination, type of contamination, residential well sampling, slurry wall/containment issues, health risks, and other issues.

A. General Site-Specific Issues

1. **Comment:** A citizen asked about the owner and taxpayer of the building on site.

Response: Cooper Industries owns the building on site. The county recorder's office will have information on taxes related to the building and the site property.

2. **Comment:** A citizen asked whether EPA would pay the fair market price for buildings and property if residents near the site decided to leave.

Response: Except for extremely unusual cases such as the dioxin contaminated site Times Beach, EPA does not purchase residents' property near Superfund sites. EPA's goal is to clean up Superfund sites so that they do not impact residents' health or their ability to sell their property. The Osborne Landfill Site is close to being remediated. The contaminant source has been contained and EPA expects the affected ground water in the area to reach safe levels within three to five years.

3. **Comment:** A citizen asked about the direction of runoff, and was confused regarding the discussion of site drainage via surface water runoff versus seepage from the onsite pond to the mine voids. The citizen was concerned that surface water and ground water flows could have contaminated the shallow aquifer with site contaminants.

Response: Figure 2 in this Record of Decision shows the influent stream and effluent stream at the site prior to construction of the slurry wall/cap. Surface water generally entered the site from the cornfield to the north of the site and via the influent stream. The spoil piles to the southwest of the site generally prevented runoff from the site except at the southern end of the site. Site surface water drainage was to the wetlands at the southern end of the site which drained into the effluent stream shown on Figure 2. A more detailed depiction of site runoff is shown in figure 3-23 of the Final Remedial Investigation Report dated August 1989.

Water from the influent stream drained into pond no. 1 shown in figure 2. Pond number 2 then leached into the fill and could also drain in the subsurface to the mine voids or flow to the southeastern end of the site where it could emerge as leachate springs draining into the wetlands. The wetland sediments were tested during the NUS investigation for site contaminants and resampled during the most recent investigation.

4. **Comment:** A citizen asked whether EPA placed and sampled wells in the glacial material [West of the site] to determine whether the glacial material was contaminated.

Response: EPA did not place or sample wells in the glacial material during the most recent Remedial Investigation, however EPA did place and sample wells in the shallow zone to the west of the site during the Remedial Investigation conducted in the late 1980s for all site contaminants including metals. Contaminants were not found in these samples at levels of concern.

5. **Comment:** A citizen asked whether EPA examined the potential that water could leave the site in any direction.

Response: Surface water runoff has been described in the response to question 3 above. The direction of ground water flow in each of the aquifers at the site is described in the Record of Decision and specifically is shown in Appendix A of the ROD.

6. **Comment:** A citizen asked whether the water from the mine void was being drawn into the slurry wall containment by the extraction wells.

Response: Some water is certainly infiltrating into the containment area from the surrounding formations. EPA expected some leakage along the slurry wall and through the base of the containment. This leakage is the reason that EPA insisted on extraction wells inside the fill area. Somewhat less water is leaking into the containment than expected during the remedial design. Leakage is not a negative aspect, since the more water that leaks into the containment, the faster contaminants will be flushed out of the fill and removed by the water treatment plant. The extraction wells will continue until the fill poses no threat to ground water. Increased pumping does however increase operations and maintenance costs to Cooper Industries.

7. **Comment:** A citizen asked whether EPA knew where the water in the mine voids was moving and what its source was, other than the pond.

Response: The flow in the mine void is toward the southeast. The water in the mine void is derived from precipitation and infiltration via many sources, as well as ground water flows. EPA has not performed a detailed study of the area wide ground water flows into and out of the mine pool. EPA has studied ground water flows near the site, and this is sufficient to understand the risks from the existing ground water contamination.

8. **Comment:** A citizen asked why no wells were monitored in 1996.

Response: In general, all wells are sampled as part of a Remedial Investigation and then there is a period during which the Remedial Investigation, Risk Assessment and Feasibility Study reports are developed and approved. During this time period, which can take one to two years, the monitoring wells are usually not sampled. Residential wells at risk may be sampled during this period if necessary. The Remedial Investigation showed that, except for the Eickmann well, contamination was confined to the ground water under the cornfields east of the site. Additionally, Cooper Industries extended the water line around the eastern side of the site and connected all individuals along the water line except the Kring and Parker residences. In EPA's opinion, the risks to the public from ground water contamination were low. EPA made the completion of the slurry wall, cap and extraction system a higher priority than the ground water action. Other projects with greater risks needed to be addressed during this time period.

9. Comment: A citizen asked when EPA will announce its clean-up decision.

Response: EPA first considers all public comments and makes any necessary changes to the Proposed Plan. EPA developes the ROD, formally selecting the clean-up plan for the site ground water, places the ROD in the information repository, and announces its availability in the local newspaper.

10 Comment: A citizen asked about elevated metals concentrations (particularly arsenic - average 36 ppm) in the offsite pond sediments.

Response: The results of chemical analysis of the compounds in the offsite pond do not match the "finger print" of compounds on the Superfund Site. There is a small section of the offsite pond on a nearby residential property that appears to been filled in with mine spoil or some other fill which may have elevated the arsenic levels. Additionally, the influent stream, which did not pass through the site, also had somewhat elevated levels of arsenic in its sediments. Arsenic is often linked to agricultural sources. At one time, arsenic was a common pesticide used by agriculture (lead arsenate). Pesticides can range from 22 to 60 % arsenic. Additionally, phosphate fertilizers can range from 2-1200 ppm arsenic and nitrogen fertilizers can range from 2-120 ppm arsenic (Kabata-Pendias an Pendia 1984). The site is surrounded by nearby agricultural land use. Background levels in soils range from 1-93 ppm although the average level in U.S. soils is about 7 ppm. In summary, the arsenic level is only five times higher than the U.S. average background levels in soils and is within the range of arsenic levels typically found in area soils. The soil and sediment levels onsite are lower than the levels in the offsite pond and correspond to typical background levels. EPA does not believe that the elevated arsenic levels are due to site activities.

11. Comment: A citizen asked whether the water quality on the Federally-protected wetland on the site has been tested.

Response: Yes. The wetland showed minimal contamination.

12. Comment: A citizen commented that the comment period should be extended because there is not a complete record of information at the Grove City Library.

Response: EPA extended the public comment period to October 9, 1997.

B. Extent of Contamination

1. Comment: A citizen asked at what distance and direction from the landfill EPA tested residential wells.

Response: Residential wells were sampled to the northeast of the site, the east of the site, and southeast of the site. The rationale for this sampling pattern was the presence of the mine pool to the northeast, the east and the southeast. The farthest well to the northeast (Dinninger) was over 1/2 mile from the site, the farthest well directly east was about 1/2 mile (Stillwagon), and the well farthest to the southeast - almost directly south - (Grand) was about 1/4 mile away.

2. **Comment:** The citizen asked for clarification concerning whether EPA was required by law to test all residences within a quarter mile radius of the site.

Response: During site investigations, EPA tests wells, based on an understanding of site conditions and contaminant migration. EPA knows of no Federal or State regulation which requires periodic sampling of residential wells within a specific radius of a landfill.

3. **Comment:** A citizen asked whether EPA tested the Kring well quarterly since it is in the direction of the plume.

Response: EPA tested the Kring well once in 1988, once in 1993, and three times in 1994. No contamination was ever detected in this well. EPA will include the Kring well in the monitoring program that is part of the cleanup plan for the site to ensure that the contamination in the plume continues to be confined to the cornfields and that the contamination in the Eickmann well area does not migrate to the Kring well.

4. **Comment:** A citizen asked EPA to draw a map of the plume based on the testing results.

Response: The exact shape of the plume is irrelevant so long as EPA has defined the area that the plume is limited to by clean wells outside the plume. EPA has mapped the general extent and direction of the plume based on monitoring well sampling results. The important point is that a band of clean wells over a substantial timeframe has generally defined the extent of the plume. EPA cannot draw a map specifically outlining the plume because of the mined environment. A smooth drawing of an interpolated plume limit would be misleading. Even by drilling many more wells and conducting more extensive sampling, EPA still could not define the exact shape of the plume.

5. **Comment**: A citizen asked whether the Clarion Aquifer and the mine are interconnected.

Response: Yes. The Clarion Aquifer and the mine are interconnected as explained in detail in the Record of Decision and the Remedial Investigation report. The Clarion Aquifer is a relatively thin layer of sandstone above the mine voids. Subsidence has caused fracturing of the sandstone which increases the communication between the voids and the aquifer.

6. **Comment:** A citizen asked whether a preferential pathway, similar to the one EPA believes is impacting the Eickmann well, could exist beyond EPA's understanding of where the plume ends.

Response: This question implies that it is possible to define the subsurface environment with absolute certainty. A preferential pathway for contaminant plume migration beyond the waterline is possible, but unlikely. If EPA studied the site and installed an additional 100 wells this possibility would still exist, as it does at every single Superfund Site. While most sites don't sit above mine voids, most sites do contain bedrock in which fractures can provide an unknown path of contamination. Fortunately at this site, EPA has a great deal of data both on ground water flow directions, and extent of contamination. Furthermore, the concentrations of contaminants are currently approaching safe levels. Therefore, EPA deems the risk to the public to be very low.

7. Comment: A citizen asked whether the proposed monitoring program will show the extent of the plume.

Response: EPA has established the extent of the plume. The purpose of the proposed monitoring program is to make sure that the levels of contamination in the Clarion Aquifer continue to decline and will reach safe levels within three to five years. The purpose of the monitoring program is not to try to define the extent of the plume. However, in the unlikely event that the plume has changed and migrated to the east, the monitoring program would reveal the change and EPA would have to reappraise the risk to the public and the Natural Attenuation Remedial Action.

8. Comment: A citizen asked whether the levels of contamination that EPA detected in the Clarion Aquifer during testing for the first proposed clean-up plan were similar to those levels detected in the Eickmann well.

Response: Detections have generally been low and sporadic in the Clarion Aquifer. One well showed a level of 47 ppb in the past in the Clarion Aquifer. This level showed a steady decline over the years and the wells between the site and the Eickmann well have not showed a corresponding increase. EPA does not believe that the plume has migrated from the site to the Eickman well and further east as some commentors suggested.

9. Comment: A citizen asked how EPA determined that contaminated water was being drawn from the mine pool and not the Clarion Aquifer during testing for the first proposed clean-up plan, since the two are connected. The citizen also asked about the location of the pump test wells.

Response: Wells were completed in both the mine voids and in the Clarion sandstone above the mine voids. Much more contamination was found in wells completed in the mine void wells than in the sandstone wells. During a pump test of the Clarion Aquifer, the radial influence of the pumping wells laterally was very small indicating that the water moved up from below.

The original proposed clean-up plan involved first treating the water in the Clarion Aquifer, which was used for drinking water, and then the water in the mine pool. When the pump test was conducted for this clean-up plan, EPA found that the proposed system would draw the contamination up from the mine void into the Clarion Aquifer, further contaminating the Clarion Aquifer. EPA knew this because EPA other wells around the pump test well were monitored to determine the cone of influence. The data from these other wells indicated that the pump test well was not developing a cone of influence, and that more contaminated water was coming from the mine pool.

The location of the nest of wells was at the extreme southeast end of the site, near MW-V2 on Drawing 95414.18-M1 of the Feasibility Study. This location was selected because vinyl chloride was highest at this location and was, therefore, the best location for an extraction well.

10. Comment: A citizen asked whether the data from the pump test for the initial clean-up plan was publicly available.

Response: Additional details on this testing is available in the appendices of the Remedial Investigation. This data is available at the local information repository, the Grove City Library, 125 West Main Street, Grove City, and also in the EPA Region III information repository located at 841 Chestnut Street, Philadelphia.

11. Comment: A citizen asked whether EPA tested wells only east and southeast of the landfill.

Response: See response to comment number 1 above. Also see figure 95414.18-M1 in the Feasiblility Study located in the site repository. Also see 95414.1-E1 which shows all monitoring wells tested during the last remedial investigation. The first Remedial Investigation during the late 1980s defined flow directions in each of the respective aquifers and determined which contaminants were migrating from the site in ground water. EPA based the location of the wells in the last supplemental Remedial Investigation on the finding of the 1988 Remedial Investigation.

12. Comment: A citizen asked whether EPA tested any private wells to the north of the site.

Response; No. EPA did not test any private wells to the north of the site. The homes north of the site are served by a public water line and ground water flow direction in the contaminated Clarion Aquifer is to the southeast.

13. Comment: A citizen asked in which direction the Clarion Aquifer is moving.

Response: Flow in the the Clarion Aquifer moves to the <u>southeast</u>. The mine void or pool controls the movement of the Clarion Aquifer. When the landfill still existed, the pond in the north end of the landfill was fed by a stream and the water in the pond fed directly into the aquifer with no outflow. During wet periods, the water in the pond would build up and force water through the aquifer to the east. During dry periods, the stream and the pond would start to dry up and reduce the flow component to the east. Thus, the flow of the water **may** have fluctuated more to the east during periods of heavy rainfall. A flow component to the east from water draining from the onsite ponds has been eliminated by installing the slurry wall and clay cap.

14. Comment: A citizen asked whether, during wet periods, the increased flow through the aquifer was helping dilute the contamination.

Response: The water being forced through the aquifer during wet periods comes from the pond where it has collected contaminants. Therefore, during wet periods, contaminated water, not clean water, is being forced through the aquifer. However increased clean ground water flows from outside the aquifer would tend to reduce contamination.

15. Comment: A citizen asked whether EPA had determined the rate that the water flows into the mine by using a dye test.

Response: EPA tried using a dye test during the aquifer pump test. The dye injected nearby never was drawn to the extraction well. The random location of galleries and convoluted pathways would probably give widely varying results based on the injection point. Therefore, EPA does not believe that dye tests would be worthwhile at this site.

16. Comment: A citizen asked whether there is a mine void connection to the Kring pond.

Response: The Kring pond is a strip-mined pit that is right on the border of the deep-mined area. However, it is not known whether there is a mine shaft directly opening to the pond.

17. Comment: A citizen asked whether the Kring pond was directly connected to the landfill and could become contaminated.

Response: The Kring pond is connected to the mine pool, and the landfill is also connected to the mine pool. There is no data which suggests that the Kring pond has become contaminated through connection to the mine void. Metals and other compounds have not migrated to the adjacent aquifers and contaminant levels of vinyl chloride in the mine pool are low. The Kring pond has been sampled several times and the results have indicated no vinyl chloride contamination.

18. Comment: A citizen asked whether the mine void discharged at the Kring pond.

Response: As explained previously, ground water in the mine void moves towards the southeast. Water to the northwest of the Kring Pond would be expected to flow to the Kring pond. EPA has not studied this issue in detail, because this information is not needed to address the contaminant plume.

19. Comment: A citizen questioned EPA's assertion, based on declining vinyl chloride levels in monitoring wells, that the plume has contracted. The citizen instead alleged that the plume may have moved beyond EPA's plume boundary.

Response: Long term ground water contamination from a source such as the Osborne Landfill does not generally "migrate" to new areas. Typically, a ground water plume emanates from a waste source just as a smoke plume emanates from a fire. A smoke plume is diluted as it mixes with air until at some distance it is no longer visible. At the peak of the fire, the visible smoke extends the farthest from the fire. As the fire is exhausted, the smoke plume contracts and extends less far. As the fire dies and only embers are left, the smoke will only be visible very near the fire. During the 1970s, the Osborne ground water contamination plume probably extended much farther to the southeast than it does today, and may even have extended into the Homewood, Connoquenessing and Burgoon Aquifers. Since the landfill closed in 1978, almost twenty years ago, EPA believes that the plume is contracting, not moving to new areas. The selected remedy will monitor the plume to verify that the plume continues its decline.

20. Comment: Several citizens questioned EPA's use of the Eickmann well to demonstrate that contamination in the aquifer has decreased.

Response: The Eickmann well is just one piece of data in the overall contamination picture. Although the vinyl chloride in the Eickmann well has fluctuated, the overall trend of contamination in the Clarion Aquifer is downward.

21. Comment: A citizen questioned the validity of the Eickmann well data because it was not tested repeatedly under the same conditions. The citizen was making reference to the fact that the Eickmann well is no longer used.

Response: The sampling efforts conducted around the site since 1986 have been substantial. Many of the domestic wells were only sampled once during a very extensive sampling effort. Most of these wells were not resampled because they were clean and the extent of contamination was adequately defined. Sampling of the Eickmann well has continued even though this well is no longer active. Even though the removal of this well from active use constitutes a change in conditions, this change is likely to be insignificant in terms of water quality. A typical domestic well withdraws only a couple of hundred gallons per day of water and does not develop a substantial capture zone. Termination of its use has not had a substantial impact on the hydrogeologic regime in this area.

22. Comment: A citizen proposed that some of the nondetects on the edge of the plume may have been caused by the ebb and flow of ground water in the Clarion Aquifer.

Response: Of course there is always seasonal variability due to precipitation and attendant increased ground water flows. EPA believes that sufficient data was gathered over the years to have an accurate enough assessment of the contaminant plume. Additionally, this ROD requires additional sampling which will further define the current state of the ground water contamination plume.

23. Comment: A citizen asked what has stopped contaminated water from seeping through the porous spoil to the west of the site.

Response: Cooper Industries' contractor and EPA documented that the elevation of the spoil piles limits surface water runoff. Additionally, ground water elevations demonstrated that ground water flows into the fill from the adjacent wetlands.

24. Comment: A citizen asked whether EPA had evidence confirming the hypotheses that iron levels or biological activity are affecting the rate of vinyl chloride degradation.

Response: Several facts support EPA's belief that natural attenuation is occurring. Vinyl chloride itself is not a solid waste contaminant. Vinyl chloride boils at 7 degrees Fahrenheit, which means that at normal temperatures in Grove City, it is a gas. To EPA's knowledge, Cooper Industries did not use vinyl chloride in any of its operations. Typically only the plastics manufacturing industry uses vinyl chloride (to produce polyvinyl chloride (PVC) plastic). EPA believes that it is extremely unlikely that any vinyl chloride was disposed of at the Osborne Landfill.

EPA often detects vinyl chloride at sites where trichloroethylene (TCE) solvent has been disposed into the subsurface. Trichloroethylene is a solvent which was used by dry cleaners and for metal degreasing until recently. This is one of the most common ground water contaminants in EPA Region 3. At many sites TCE breaks down into the "daughter products" Dichloroethylene and vinyl chloride and finally ethene gas, by sequentially losing a chlorine atom from the parent molecules. This can happen due to bacteria or to chemical reactions in the subsurface. The final degradation product is ethene gas which is a harmless gas emitted by ripening fruit. EPA believes that the vinyl chloride at the Osborne Landfill is the chemical "ghost" from substantial TCE contamination in the past. It will continue to degrade to ethene gas. Also, some of the vinyl chloride will volatilize into the pore space of the soil and either be degraded or dispersed in air at harmless concentrations. Dilution and dispersion also reduces the concentration of the vinyl chloride plume the further it travels from the source. The source of contamination (the fill area) has been isolated from the Clarion Formation by the slurry wall and an inward pressure gradient.

25. Comment: The citizen asked whether it was possible for the plume to be immobile. Since EPA cannot prove that the iron levels or biological activity is increasing the rate of vinyl chloride degradation, the citizen was concerned the the decrease in concentrations noted in the Clarion wells might be due to movement of the plume to the east.

Response: Long term ground water contamination from a source such as the Osborne Landfill does not generally "migrate" to new areas. Typically, a ground water plume emanates from a waste source just as a smoke plume emanates from a fire. A smoke plume is diluted as it mixes with air until at some distance it is no longer visible. At the peak of the fire, the visible smoke extends the farthest from the fire. As the fire is exhausted, the smoke plume contracts and extends less far. As the fire dies and only embers are left, the smoke will only be visible very near the fire. During the 1970s, the Osborne ground water contamination plume probably extended much farther to the southeast than it does today, and may even have extended into the Homewood, Connoquenessing and Burgoon Aquifers. Since the landfill closed in 1978, almost twenty years ago, EPA believes that the plume is contracting, not moving to new areas. The selected remedy will monitor the plume to verify that the plume continues its decline.

As explained above, EPA cannot prove the mechanism by which vinyl chloride occurred in the aquifer. However, there is no other reasonable explanation for it's presence other than degradation from PCE or TCE solvents. Since degradation has occurred, it should continue to occur. This is supported by data which shows the decline.

26 Comment: A citizen questioned EPA's assertion in the Ecological Risk Assessment that elevated levels of metals detected at the site are related to the mining environment rather than the site.

Response: As explained in the previous question above regarding metals, EPA is uncertain of the source of the slightly elevated levels of arsenic, but does not attribute them to the Osborne Landfill site.

C. Type of Contamination

1. Comment: A citizen asked which wells were routinely tested for metals.

Response: Two different Remedial Investigations examined metals in the aquifers. The results of the investigations indicated that the metals were not migrating and so EPA eliminated metals as contaminants of concern in ground water at the site. However, the performance wells directly adjacent to the landfill still monitor for metals to be certain that conditions don't change.

2. Comment: The citizen asked whether the Eickmann and Lazor wells were tested as part of the Remedial Investigations.

Response: Yes, both the Eickmann and Lazor wells have been sampled. The Lazor well has been sampled four times, and the Eickmann well has been sampled at least seven times.

D. Residential Well Sampling

1) Comment: A citizen asked why the Kring well was not tested after vinyl chloride was detected at 11 parts per billion in the Eickmann well.

Response: The Kring well was sampled four times and no contamination was detected.

2) Comment: A citizen explained that she did not connect to public water because her well had tested clean but that she was told that her well would be periodically tested and that she could connect to public water if contamination was detected. Her well has not been tested for two and a half years.

Response: EPA encouraged all residents on the perimeter of the site and in the direction of the plume's eventual flow to connect to public water. EPA did not and legally could not make a commitment to residents to periodically test their water indefinitely. However, the well in question is proposed for periodic testing as part of the current proposed clean-up plan.

3. Comment: A citizen asked whether EPA had determined which residential wells would be monitored as part of the clean-up plan.

The residential monitoring wells are defined in this Record of Decision which contains additional sampling of wells added after the public meeting. The first round of sampling will test all residential wells that had previously been sampled by Cooper Industries and EPA. The later rounds will continue sampling those residential wells previously sampled that have not connected to the water line.

4. **Comment:** A citizen asked for a contact to ensure that the wells are monitored.

Response: Citizens should contact Mr. Frank Vavra, Remedial Project Manager, with questions about residential well sampling under the proposed monitoring program. Mr. Vavra can be reached by mail at 841 Chestnut Street, Philadelphia, PA 19107; by telephone at (215) 566-3221; or by e-mail at vavra-frank@epamail.epa.gov.

5. **Comment:** A citizen asked whether EPA would continue to test her well even though she refused connection to public water.

Response: This resident's well is included in EPA's monitoring program.

6. **Comment:** Several citizens commented that more sampling is needed before EPA should determine how to proceed.

Response: EPA has conducted extensive sampling over several years and has noted a dramatic decline in contaminant levels over time. EPA's data shows that the contaminant plume is naturally degrading and shrinking. Additional sampling will be conducted to verify this conclusion. Some citizens recommended sweeping new investigation requirements that are unwarranted given the consistently declining contaminant levels identified by the sampling conducted to date. The fastest way to get additional extensive sampling information was to issue a ROD for monitored Natural Attenuation. According to the law, if the sampling shows a significant new problem(s), EPA would revisit this decision.

7. **Comment:** Several citizens stated that their wells were tested only once.

Response: The majority of the residential wells are sidegradient to the contaminant plume. That is, they are next to the contaminant path, not on it. In addition, all but one of the residents on the perimeter of the landfill are connected to public water. The wells that were only sampled once are generally those well farthest from the site that were checked even though the probability of contamination was extremely low. These residents have a safe supply of drinking water. Some of these residents' wells will be monitored as part of the clean-up plan to ensure that the contamination in the plume continues to degrade at current rates. However, continued monitoring of all of these residential wells, from a risk perspective, was not necessary because they have a safe drinking water supply, as well as being out of the path of the contaminant plume. Their wells will be checked in the first round of sampling under this Record of Decision.

8. **Comment:** A citizen stated that sampling of residential wells was necessary before proceeding because the existing data is "old."

Response: EPA's selected alternative will obtain sampling data on residential wells.

9. Comment: A citizen requested that quarterly monitoring data for 1996 and 1997 be placed in the information repository

Response: There is no quarterly monitoring data for 1996. Quarterly monitoring data will be placed in the information repository as it becomes available, if the library is willing to accept it.

E. Slurry Wall/Containment Issues

1. Comment: A citizen asked what testing EPA/Cooper Industries had conducted to ensure that the clay layer was continuous under the entire containment area and was impermeable.

Response: Cooper conducted test drilling approximately every hundred feed along the slurry wall to detect mine voids and determine the existence and thickness of the clay layer.

2. Comment: The citizen asked whether any drilling was done inside the containment area, in addition to the testing along the edge.

Response: Cooper installed extraction wells to create a negative pressure inside the containment area. The negative pressure inside the containment area ensures that all water flows into the containment area and therefore, even if the bottom clay layer is missing in places, no water can escape the containment area. Some wells were installed during the 1980's investigations which have drilling logs that can be used to assess the existence of the clay layer. Cooper Industries evaluated all of the past data and concluded that the clay layer was present over most of the site except near the southeast area of the site where it was glaciated. Regardless, EPA expected some clay to be missing. The inward hydraulic gradient created by the extraction wells was selected to deal with this problem.

3. Comment: The citizen asked whether the standing water table is higher than the bottom of the containment area under all conditions so that the negative pressure inside the containment area is always maintained.

Response: Cooper installed well nests in the force walls around the containment area. There are three wells, called performance wells, in each well nest. One is installed inside the containment area to the depth of the clay layer. Another is installed to the same depth outside the containment area. A third is installed outside the containment area into the aquifer below the clay layer. These wells are monitored to ensure that the water levels in the outside wells are higher than the water level in the inside well and the negative pressure inside the containment area is maintained. The typical standing water level outside the landfill is expected to always be above the floor of the containment and is monitored.

4) Comment: The citizen asked whether the clay layer boring data are publicly available.

Response: This is design data and is not normally sent to the repository. EPA mistakenly told the public that the data was available in the repository. Very large volumes of data are available in the EPA office on the site that are not available in the site repository. EPA will have Cooper Industries send a copy of the report containing this information to the site repository.

5. Comment: A citizen asked how long the site has been contained.

Response: The source of site contamination has been contained in the slurry wall for approximately one year.

6. Comment: A citizen asked whether continuous pumping of the extraction wells affects local aquifers or the mine system.

Response: No. After treatment, the water is reinjected into the mine voids to maintain hydrostatic equilibrium. The volume of the mine pool is huge compared to the water extracted and injected.

7. Comment: Does EPA have a permit to discharge the treated water back into the mine voids.

Response: Although, EPA does not need a permit to reinject the treated water. With regard to the reinjection of treated water, EPA is only required to follow state substantive requirements such as contaminant levels, but not the procedural requirement of obtaining a permit. PADEP did review both the ROD and the design documents for the containment and treatment plan.

8. Comment: A citizen asked about the rate of the extraction system?

Response: The average extraction rate is less than 30 gallons per minute.

9. Comment: A citizen asked whether the reinjection rate was about 30 gallons per minute as well?

Response: Yes.

10. Comment: A citizen asked what the total acreage of containment was at the site.

Response: The total acreage of containment is about twelve acres.

11. Comment: The citizen commented that the rate seemed high and questioned whether water from the mine voids was being pumped into the containment area to maintain that rate as it seemed too high for recharge from rainfall.

Response: A small amount of water is coming through the cap and up through the bottom. However, this movement ensures that there is no migration out of the containment area. The design specifications estimated that about 30 gallons per minute would be needed to maintain the inward gradient, and nominally, that is what is being extracted and injected.

F. Health Concerns

1. Comment: A citizen commented that many people in the neighborhood have heart disease or cancer or have died.

Response: The background cancer rates for citizens in the the United States has been estimated at 30-40 percent. EPA is cleaning up the Osborne Landfill Site as quickly as possible. There are no known current users of the contaminated ground water. Potential exposure to the fill has been eliminated. The Agency for Toxic Substances and Disease Registry (ATSDR) is reviewing the health statistics in the area.

2. Comment: A citizen asked whether EPA will issue a widespread notice to Grove City residents that the Clarion Aquifer that it will not be safe for five years.

Response: EPA has had periodic public meetings to discuss the site, fact sheets have been issued and numerous articles about the site have been published. Additionally, EPA believes the plume is contained within a relatively small area and does not believe that a widespread notice is appropriate. EPA will conduct an effort to inform residents who live near the site with fact sheets and other information.

3. Comment: A citizen asked whether she/he could safely drink from the Clarion Aquifer at his/her residence right now.

Response: Current data and understanding of ground water movement indicate that the Clarion Aquifer is safe at that location.

4. Comment: A citizen commented that a health study should have been conducted recently.

Response: The Agency for Toxic Substances and Disease Registry (ATSDR), which monitors EPA's investigations from a public health perspective, performed a health assessment of the site area in 1991. The document is available at the Grove City Library. EPA received no letters, phone calls or complaints from residents or their elected officials since 1991 about health problems. The ATSDR is now reviewing health statistics and will issue a report early next year.

G. Other Issues

1. Comment: A citizen asked where Cooper disposed of their waste before the Osborne Site was available.

Response: This question should be posed to Cooper Industries. The company may have records indicating where such waste was disposed. Mr. Weinzierl, a Cooper Industries representative, indicated that he did not believe the company had such records but that he would investigate. This is not an EPA responsibility to follow up on.

2. Comment: A citizen asked whether Cooper's waste could have been disposed at the Johnstown Foundry.

Response: Mr. Weinzierl (Cooper Industries) indicated that it was unlikely as the company took core samples in the area and found nothing.

3. Comment: A citizen asked whether Cooper disposed of vinyl chloride anywhere else in the area.

Response: Vinyl chloride is a gas used in producing polyvinyl chloride (PVC), a type of plastic. It also is formed by the degradation of certain solvents. It is highly improbable that Cooper Industries disposed of vinyl chloride because it is a gas used by the plastics industry.

4. Comment: A citizen asked what EPA is doing to address concerns about the Tri-County site, also associated with Cooper.

Response: EPA notified its Site Investigation Section as well as Mr. Bob Kimbell of PADEP of citizen concern about the Tri-County Landfill after the concern was first raised. The Tri-County Landfill currently is under the regulatory jurisdiction of PADEP and all questions and concerns about the landfill should be addressed to PADEP.

5. Comment: A citizen asked whether EPA can hold Cooper accountable for waste taken to the Tri-County site.

Response: Currently, EPA is unaware of documented disposal of regulated hazardous waste at the Tri-County site. Even if such evidence existed, this would still be the responsibility of the PADEP. EPA has no authority over solid waste landfill facilities unless they are listed on the National Priorities List. Operating solid waste landfills are regulated in Pennsylvania by the PADEP. The same is true for operating hazardous waste landfills. Congress developed the Resource Conservation Recovery Act with the goal of delegating RCRA's responsibilities for the regulation of certain hazardous waste activities. Pennsylvania has been delegated this authority. Thus, even if an incident of hazardous waste disposal had occurred at the Tri-County Landfill, the PADEP would be the appropriate regulatory authority to address the issue.

6. Comment: A citizen complained about the quality of water - that it turns black with the seasons and is corrosive.

Response: EPA believes the water quality is caused by naturally-occurring levels of iron and manganese, not site contaminants. These levels of iron and manganese are a problem in the Homewood, Connoquenessing, and Burgoon aquifers in the area near the site. This resident is located both upgradient and far from the site.

7. Comment: A citizen asked whether collapsing land to the west of the site was related to the site.

Response: EPA believes that the collapsing land near Grove City is unrelated to the site. EPA is reinjecting the treated water from the containment area back into the mine voids to ensure that the site cleanup does not have a subsidence effect on nearby residents.

Part II Written Comments Submitted During The Public Meeting

Hilda Kring

Comment: Will EPA test my well?

Response: EPA will we test her well. Answered in more detail in Part III.

Unsigned Comment

Comment: One resident commented that the earthworms on her property were not tested. The resident also commented that they believe that the injection wells could be spreading contaminants through mine tunnels. The resident also was concerned about high acidity and what the treated water is washing out of the ground.

Response: Earthworm testing was only conducted in the wetlands adjacent to the site to determine if the very low level of PCBs, which was below EPA's cleanup standard, could be bioaccumulating in earthworms. PCBs entered the wetlands via surface water runoff. EPA has no reason to believe that PCBs from the site are present on any of the residential properties.

Contaminant spreading through mine tunnels - addressed previously.

The water that is injected into the mine pool is not acidic and is tested routinely. After the public meeting, EPA asked the PADEP to test the stream carrying runoff from the landfill cover to see if the cover could be creating acidic surface water which might leach into the aquifer downgradient. The runoff water from the cap was slightly basic - not acidic.

Ann Stilwagon

Comment: My water turns black and eats away my pipe fixtures, enamel on washing machine tub. The resident believes that public water is even worse and they use bottled water. The resident's animal has lumps, her neighbor died of cancer. The resident had a stroke and attributes all of the problems above due to the Osborne Landfill Site.

Response: The black water (manganese) has been addressed previously. EPA received results from the municipal water authority which shows that they are meeting all of the EPA's drinking water standards. EPA believes that it is unlikely that the health problems cited are related to well contamination due to the Osborne Landfill. This resident lives a substantial distance from the landfill and EPA considers her well to be upgradient. Several residential wells that are between this resident and the site have not contained contamination when tested in 1993 and 1994. This residents well was tested for volatile organic hydrocarbons in 1993 and no contamination was detected.

Part III Written Comments Submitted During The Comment Period

Shirley Donan

Comment: EPA resisted a slurry wall solution, but Cooper Industries prevailed and obtained a remedy which left waste in place.

Response: The originally preferred alternative set forth in the Proposed Plan (onsite, lined landfill) would not have removed the waste, nor would the PADEP's preference (incineration and then placement in an onsite lined landfill) have removed the waste from the site.

EPA was not coerced into selecting a different alternative by Cooper Industries. The geological environment at this site is extremely complex, and there were daunting technical problems implementing any remedial action contemplated. After Cooper Industries requested the opportunity to supply EPA with information supporting a slurry wall/Clay Cap containment, EPA formed a panel of experts to review all of the site information and to give EPA its recommendations. The panel was composed of one expert from EPA's office of Research and Development, and two prominent experts on slurry walls from the U.S. Army Corps of Engineers. This panel supported the slurry wall solution suggested by Cooper Industries, and cautioned the EPA project manager against options involving excavation. They were concerned that even if the highwall was grouted closed and the excavation drained, the excavation of a large area adjacent to a large mine pool risked "blowing out" a wall and perhaps killing workers in the excavated area during construction.

EPA partially selected the slurry wall in response to public comments expressed at the public meeting or received by mail in the Fall of 1989. In 1989, Cooper Industries was one of the largest local employers. Many of the public attending the meeting expressed doubt about the risk from the Osborne Site and were concerned about the financial impact on Cooper Industries. The majority of the public attending the public meeting favored allowing Cooper Industries to implement their proposed slurry wall remedial action.

Comment: That surrounding residents drank from wells at risk for 11 years before a water main was offered to them in 1995.

Response: Several investigations were conducted through the mid-1980s through the mid-1990s. These investigations did not suggest that residential wells were at risk. During the late 1980s and afterwards, residents had municipal water available to them to the north, west and south of the site. Selected residential wells potentially at risk were sampled during the 1988 remedial investigation and did not contain contamination. This was consistent with EPA's understanding of the site's hydrogeology. During the supplemental focused Remedial Investigation, one and only one residential well contained contamination. A more comprehensive residential well sampling was conducted and no additional contaminated wells were found. At that time, Cooper Industries extended the municipal water line so that the entire perimeter of the site has public water available to the residents at risk. EPA's selected remedial action will provide substantial new sampling information which will partially address the concerns expressed at the public meeting.

Comment: Skepticism was expressed that the site contaminants are "cleaning up". The commentor was incredulous that vinyl chloride could drop from 10 ug/l to less than 1 ppb in several months. Additionally, the commentor expressed concern that the decrease might be due to injection of the treated water from the containment.

Response: Several facts support EPA's belief that natural attenuation is occurring. Vinyl chloride itself is not a solid waste contaminant. Vinyl chloride boils at 7 degrees Fahrenheit, which means that at normal temperatures in Grove City, it is a gas. To EPA's knowledge, Cooper Industries did not use vinyl chloride in any of its operations. Typically only the plastics manufacturing industry uses vinyl chloride (to produce polyvinyl chloride (PVC) plastic). EPA believes that it is extremely unlikely that any vinyl chloride was disposed of at the Osborne Landfill.

EPA often detects vinyl chloride at sites where trichloroethylene (TCE) solvent has been disposed into the subsurface. Trichloroethylene is a solvent which was used by dry cleaners and for metal degreasing until recently. This is one of the most common ground water contaminants in EPA Region 3. At many sites TCE breaks down into the "daughter products" Dichloroethylene and vinyl chloride and finally ethene gas, by sequentially losing a chlorine atom from the parent molecules. This can happen due to bacteria or to chemical reactions in the subsurface. The final degradation product is ethene gas which is a harmless gas emitted by ripening fruit. EPA believes that the vinyl chloride at the Osborne Landfill is the chemical "ghost" from substantial TCE contamination in the past. It will continue to degrade to ethene gas. Also, some of the vinyl chloride will volatilize into the pore space of the soil and either be degraded or dispersed in air at harmless concentrations. Dilution and dispersion also reduces the concentration of the vinyl chloride plume the further it travels from the source. The source of contamination (the fill area) has been isolated from the Clarion Formation by the slurry wall and an inward pressure gradient.

EPA agrees that it is unlikely that the real aquifer stable concentrations would change from 10 ppb to 0.75 ppb in a period of several months. However, EPA expects concentrations to fluctuate over time due to many factors, but also to show a general decline. Lab measurements at such low levels are very difficult and if the water sample is not taken carefully some volatilization can give erroneous low reported concentrations. The current concentration in the Eickmann well is probably fluctuating between 5 to 10 ppb currently, down from levels between 10 to 16 ppb several years ago.

Flow is generally to the southwest in the area of the mine pool, and the volume of the mine pool is very large. During the NUS investigation, a pump test in the mine voids at over 200 gpm failed to cause any drawdown. All three injection wells only inject less than 30 gallons per minute of treated water. One injection well is across the Pine Street near the entrance to the water treatment plant and another is also far away from the Eickmann well to the northwest. Only one well is close enough to potentially have an effect on concentrations in the Eickmann well, and this well injects less than 9 gpm at that location. EPA believes that it is unlikely that the decreased concentrations are due to the injection wells. They are more likely due to changes in rainfall and resulting increased ground water flows, analytical variations or sample handling.

Comment: When the pumps are shut down in five years or less the citizens will be at risk from contamination which may migrate to a new area.

Response: Long term ground water contamination from a source such as the Osborne Landfill does not generally "migrate" to new areas. Typically, a ground water plume emanates from a waste source just as a smoke plume emanates from a fire. A smoke plume is diluted as it mixes with air until at some distance it is no longer visible. At the peak of the fire, the visible smoke extends the farthest from the fire. As the fire is exhausted, the smoke plume contracts and extends less far. As the fire dies and only embers are left, the smoke will only be visible very near the fire. During the 1970s, the Osborne ground water contamination plume probably extended much farther to the southeast than it does today, and may even have extended into the Homewood, Connoquenessing and Burgoon Aquifers. Since the landfill closed in 1978, almost twenty years ago, EPA believes that the plume is contracting, not moving to new areas. The selected remedy will monitor the plume to verify that the plume continues its decline.

Comment: EPA should have called for a Health Assessment in 1993 because the Eickmann well was found to be contaminated.

Response: Expanded residential well sampling was conducted and only the Eickmann well was found to be contaminated. The additional monitoring well sampling conducted by CEC demonstrated that the plume was limited to cornfields adjacent to the site. No letters or phone calls from the public have been received regarding new health problems in the area since the Proposed Plan in 1989. In 1989, the public did express concern about health problems specifically brain cancers. Mr. Frank Vavra the project manager at that time contacted the ATSDR and requested their help assessing the situation. Their study did not reveal any problems attributable to the site. Since cancer has a latency period of 20 to 30 years, since only one new known residential exposure had occurred, since the plume was limited to the cornfields adjacent to the site, and since EPA had received no letters or phone calls identifying individuals with health problems in the area at risk, there was little reason to contact ATSDR. ATSDR is currently evaluating the new site information and will conduct interviews with residents. EPA is giving the ATSDR full cooperation and has supplied them with the primary site documents.

Comment: EPA selected a band aid solution and will soon shut down the remedy, stop the sparse sampling and leave the community at great risk.

Response: The remedial action for the landfill was a two year, multimillion dollar construction project and is hardly a "band aid" solution. The waste has been contained by a slurry wall and clay cap. The primary risk from the waste was direct contact which is prevented by the cap and the fence. The slurry wall and leachate extraction system prevents the very low levels of contamination in the fill area from moving into the ground water. The contaminant concentrations in the leachate associated with the fill have dropped substantially, and are approaching federal drinking water standards. Ground water monitoring will continue for at least seven to ten years. A total of twenty one monitoring wells in the Clarion/Mine Void formation, six wells in the Homewood Formation and three wells in each of the deeper uncontaminated aquifers will be monitored. Initially EPA will sample sixteen residential wells even though EPA believes that they are upgradient and not at significant risk, and will continue periodic sampling of six residential wells. EPA disagrees that the monitoring is sparse and considers the monitoring program to be adequate.

Comment: We need a public health survey in the area of the dump. We need permanent monitoring at a 1/4 mile perimeter or more around the dump.

Response: The Agency for Toxic Substances and Disease Registry is reviewing the site data to determine what measures need to be taken (if any)in addition to those planned by EPA. EPA must use science to construct cost effective and technically adequate monitoring programs - not arbitrary programs based on a site radius. EPA considers the source, the contaminants and the mechanisms of migration when it designs a monitoring program. EPA believes that the monitoring program in its selected remedial action for OU2 is adequate to protect the public.

Comment: The Krings are downgradient, and have been using well water, swimming in the strip mine pond with other members of the public, and have been a victim of neglect. According to Ms. Kring, her well has only been analyzed once in the past. Did the consultants give the pond a clean bill of health? Another resident suggested sampling the entire water profile from top to bottom of the lake as well as sampling sediments for heavy metals.

Response: The Krings are not downgradient. Flow is to the southeast of the site in the mine pool and the Clarion Aquifer. The Kring well has been tested five times in the past: Once in 1989, once in 1993 and three times in 1994. The Kring residence was one of the residential wells selected for additional monitoring in the Feasibility Study, the Proposed Plan and now the ROD. Additionally, Cooper Industries offered the Krings the opportunity to connect to a public water supply which periodically tests for contaminants. They have refused public water and have indicated that they believe their well provides water of superior quality compared to the public water supply. The water in the strip mine pond was tested in 1989 and did not contain site related contaminants (See Final Feasibility Study dated December 1989). This does not surprise EPA at all. Since vinyl chloride is at relatively low levels in the mine already, the mine water entering the pond would be substantially diluted. Additionally, vinyl chloride is so volatile that it would leave the pond water and be further diluted in the air. Metals and other contaminants have not been shown to migrate from the fill area in to the area adjacent to the site, so it is very unlikely that they would be found in the pond which is much farther away. In summary, the Kring well has not contained contamination in the past five sampling events, the well is not downgradient of the plume, the strip mine pond was sampled several times did not contain contamination, their well will be tested periodically in the future and if they are concerned about their water they may connect to the public water supply at Cooper Industries expense.

Ann Stillwagon

Comment: One resident felt EPA spoke down to the residents because EPA explained what scientific notation was and many of the residents already understood the concept.

Response: At public meetings, EPA tries to make sure that the presentation is understood by all residents. It is EPA's experience that some individuals at public meetings do not understand this concept.

Comment: One resident complained that notification fliers were distributed the evening of the meeting, and that some were found blowing around yards the next day. The resident implied that EPA distributed them late so that residents would not attend.

Response: EPA at this site went well beyond what is required by law, and what is usually done at Superfund Sites to encourage residents to attend the meeting. EPA is only required by law to publish a notice of the public meeting once in two local papers. EPA published the notice of the meeting on August 6, 1997 in the Sharon Herald and the Allied News at the time that the Proposed Plan was issued. An additional notice of the public meeting was published in the same papers several days before the public meeting to remind residents of the meeting. The day of the meeting, not the evening of the meeting, fliers were distributed to nearby residents to remind them of the meeting and to encourage their attendance.

Comment: One resident was disturbed that residents were only allowed to ask questions and make comments. They thought that EPA should basically take a vote at the public meeting to determine what remedial alternative should be selected and implemented.

Response: Although EPA does take concerns of residents living near Superfund Sites very seriously, the law does not allow residents to select EPA's remedial actions at Superfund Sites.

As explained in the Record of Decision, EPA's primary selection criteria are 1) Protection of Human Health and the Environment 2) Compliance with Environmental Laws 3) Long Term Effectiveness 4) Reduction of Toxicity, Mobility and Volume 5) Short Term Effectiveness 6) Implementability 7) Cost

State Acceptance and Community Acceptance are modifying criteria and are given significant consideration, but less weight than the primary criteria. If EPA can modify a remedy to improve the acceptability of the remedy in response to community concerns, it often does. In this case, EPA has increased the amount of residential well monitoring in response to community concerns.

Comment: The more definitive comments became, the more vague the (EPAs) answers became. Many questions went unanswered. Statistics can be manipulated and those presented at the meeting are not valid.

Response: EPA believes that very few questions went unanswered, although some residents may not have been satisfied with the degree of detail. EPA believes the assertion that some answers were vague was based on several unrealistic expectations.

The purpose of a Proposed Plan public meeting is to present a general overview of the potential remedial actions to the public and to identify EPA's preferred alternative. The details of the site investigations were sent to the administrative record. The three remedial investigations at the site spanned over ten years. The files from the site would fill several file cabinets. Project managers also work on several sites simultaneously. It is unrealistic for residents to expect project managers to have memorized every detail about a site and to be able to quote those details at the public meeting. EPA was generally able to furnish detailed information regarding the recent remedial investigation work.

Some of the commentors seemed to demand that EPA demonstrate absolute and certain knowledge of all the details about how water moves through the mine system. It is unrealistic to expect that degree of knowledge of a subsurface system. Furthermore, this degree of detail is also unnecessary. The geology at the Osborne Site is complicated by the presence of mines in the area, however, three extensive remedial investigations conducted at the site over more than ten years have given EPA an understanding of ground water movement at the site sufficient to implement an effective remedy and to ensure that the public health and evironment are protected. EPA generally understands the ground water flow in each of the aquifers and the extent of ground water contamination at the site. Past investigations have studied the regional flows of ground water in the Grove City Area, which show flow directions consistent with EPA's interpretations of ground water flows onsite. Some residents and the consultant from EEI Geophysical focused on the Eickmann well contamination. They asserted that since EPA did not understand exactly how the Eickmann well was contaminated, EPA did not understand the site well enough to make rational decisions. EPA strongly disagrees with this assertion. EPA's past investigations have shown the extent of the plume and the overall direction of ground water flow. EPA believes that this information, the relatively low and declining concentrations of vinyl chloride, and the monitoring network of wells provide sufficient protection of the public. The site risks were based on EPA's approved statistical methods and were reviewed by an EPA toxicologist.

Comment: One resident (Ms. Stillwagon) complained that her well was only tested one time in 1993 and that a scientific sampling would have required quarterly sampling. Also, she was informed that their well was clean, but the ditch water in front of their home was sampled repeatedly over many weeks. Why was the ditch water so interesting if her well was uncontaminated.

Response: The Stillwagon residence is the farthest residence to the east sampled and is both upgradient and sidegradient to the ground water contaminant plume. The residence was only sampled as a precaution after Cooper Industries discovered contamination in the Eickmann well. There is no minimum number of samples for scientific sampling. Of course the more samples taken, the greater the statistical confidence in the results. There are numerous wells between the Stillwagon residence and the plume. These wells were not contaminated in 1993 and 1994 which gives EPA confidence that the plume did not extend to this area. Neither EPA nor Cooper Industries ever sampled the ditch water in front of the Stillwagon residence. The ditch water may have been sampled by the state or local government for unrelated reasons.

Comment: One resident stated that this was the first year that her water did not turn black and attributed the change to the Osborne project. She was told by EPA that this was unrelated to the site operations, but she remained skeptical that her water was unaffected by the site.

Response: The ground water in the Grove City area is high in iron and manganese. References in EPA's library indicate that areas of the Homewood aquifer sometimes contain iron ore. These areas can contain ground water with such high concentrations of iron and manganese that if clear water is removed from the formation, iron and manganese will precipitate forming a black scum on the water. When EPA discovered the contamination in the Eickman well, Cooper Industries attempted to drill a deeper well to provide the Eickmanns with uncontaminated water. The new well contained high levels of iron and proved to be unusable because the iron and manganese precipitated in the toilets and sinks in his home. EPA believes the "black water" in the residents well is related to the high levels of iron and manganese in the local formations.

Comment: One resident did not believe that EPA's "reasonable risk" addressed synergistic effects over time from eating vegetables, deer in the past and other possible impacts other than using ground water. Reasonable risk does not address the financial loss of depreciated property values and impacts from past exposures.

Response: This Plan addresses ground water and wetland sediments based on current contamination levels. Vinyl chloride does not bioaccumulate in animals and plants. EPA believes that the only current site risks are from the domestic use of ground water in or near the cornfield to the east of the Site. EPA agrees that health impacts from past contamination exposure are possible, but are impossible to prove. The Superfund law does not provide compensation for health impacts from Superfund Site exposures or for reimbursement of lost property value.

Comment: The proposal to monitor the Osborne well sites and two other residences is not enough. All the surrounding residences need to be sampled scientifically and informed of the results. Only after the results have been determined to be safe should the plan be put in place. Many residents in the community want certainty, not EPA's best guess.

Response: EPA's decision is based on a massive amount of high quality comprehensive data - not guesswork. However, EPA shares the commentor's concern for the surrounding residents and will resample all of the wells previously sampled for the first round of samples. Although the residential sampling will be much less for the following sampling rounds, some additional residential wells have been added to the program. Of course if the first round of sampling showed sufficient reason to increase the scope of the residential well sampling, EPA would do so.

Comment: One resident was concerned about statements made by the EPA project manager regarding situations where he couldn't spend government money or that he would be embarrassed if he made the wrong decision. The resident asserted that EPA showed too much concern for economics and ignored the risk to the public.

Response: The EPA project manager was merely pointing out to the public his limitations, and

EPA's legal limitations regarding what can and cannot be done for the public. These limitation include compliance with EPA guidance, legal constraints and fiscal constraints. For example, one resident supported by other residents thought that EPA should be willing to buy the homes of residents near the site if they wanted to sell. The project manager explained that this is not EPA policy and that Congress empowered EPA to remediate sites and to protect the public, but did not empower EPA to protect them from financial harm from Superfund Sites. The project manager explained that the process from the ROD to actually beginning remediation generally takes 3 to five years. One year to negotiate or order an agreement, two years to design a remedial action system, and one to two years to construct and approve a system. EPA believes that the contaminants will have declined to MCLs in five years, so, if he selected pump treatment of ground water as the remedy the site might be clean by the time the remedial system was constructed. This could produce the embarrassing situation of constructing a system for millions of dollars and never using it.

Jane Scott Cleary- President of CEASRA

Comment: One resident commented that contrary to discussions in the public meeting, volumes K and J were missing and volumes L,M, N,and O were not delivered until after the meeting. The resident went to the meeting and was frustrated that recent well monitoring data was not available.

Response: EPA regrets that volumes K and J were missing. When an administrative record update is delivered to a library, it is accompanied by a form which should be filled out by the librarian and returned to EPA. It documents that the update has been received and asks that any missing volumes of the record be identified. The librarian informed the EPA that she returned the form with a note identifying the missing volumes. EPA's employee responsible for maintaining the administrative record room in Philadelphia never received this form and the EPA Project Manager was unaware of the problem.

The key documents supporting the Record of Decision were present in the library at the beginning of the comment period. The primary documents that EPA makes its decision on are the Remedial Investigation Report, the Feasiblility Study, and the Risk Assessment. The Remedial Investigation contained several key reports as appendices, including the entire biological investigation report and the alternatives analysis report. The information contained in volumes L, M, N, and O were supplemental information that EPA added that was not integral to the decision. Regardless, EPA extended the comment period to allow the public additional time to review this information.

Comment: One resident requested quarterly monitoring for at least one year for 20 additional wells within a 2 mile radius of the Osborne site, north, south, east, and west. They requested that all hazardous substances be monitored for in the first sampling event. Any detected contaminants should be tested for on subsequent sampling events. Residents on well water within a three mile radius should receive written notice of the statement that the Clarion Aquifer will not be clean for five more years.

Response: Past investigations do not support the massive residential sampling effort requested by this resident. The site ground water has been sampled in every direction and in all of the relevant aquifers in the past for a wide array of contaminants. Additionally, the six performance wells nests adjacent to the_fill area sample monitoring wells in the Clarion and Homewood aquifers in all directions for a wide array of contaminants. Current sampling of these performance wells do not indicate a semi-volatile or metals contaminant plume. The only contaminant plume identified by three past remedial investigation is limited to vinyl chloride and traces of other volatiles in the mine pool to the east of the site. EPA has revised the ROD so that virtually all of the residential wells that were tested in the past by Cooper Industries will be sampled in the first round of testing. After that event, the residential wells in this group that are still being used for household purposes will be sampled annually until MCLs are met in the plume for five years. EPA also does not believe that the massive notification effort (all residents in a three mile radius) of Clarion Aquifer contamination is warranted. Public notice of the meeting has been issued, local newspapers have recently published numerous articles about the site, and the contaminant plume is quite limited. EPA will conduct some public affairs efforts to make residents near the site aware of the site status through fact sheets.

Comment: One resident stated that when Eickmanns high 1995 level of vinyl chloride was omitted from the slide during the August 25th presentation, they lost confidence in the integrity of the presentation.

Response: Due to other conflicting work requirements, the public meeting presentation was prepared with very limited time and was not as thorough and detailed as it should have been. There are numerous blueprints in EPA's files which show historic vinyl chloride concentrations. EPA constructed the slide from a blueprint Drawing 911870U4-M1 dated 1/12/95. This blueprint did not contain the 1995 Eickmann well result. This was simply an error and there was no attempt to mislead the public or hide the data. In fact, the 1995 data was shown in the blueprint in the Feasibility Study which EPA had placed in the Administrative Record well before the public meeting. At the public meeting, EPA did not contend that vinyl chloride had reached levels of one ppb, and in fact stated that EPA would not be surprise to see the next sample rebound to higher levels, but that overall the average trend is downward. The Record of Decision contains a table showing all available Eickmann well results.

Pat Brenner

Similar comments to other commentors - Sample Kring Pond, add additional residential well sampling. Addressed elsewhere.

Hilda Kring

Requested additional residential well sampling. Addressed elsewhere.

EEI GEOPHYSICAL.CONSULTANTs

1) Comment: EPA's presentation made it clear that EPA has neither investigated the extent of contamination in the glacial tills west of the Site where heavy metals have been identified nor have you defined the extent of the contamination plume to the east of the Site. It is clear that your work is based on studies completed eight years ago and that you have all but ingnored the heavy metals issues.

Response: The Remedial Investigations conducted during the 1980's and completed in 1988, were thorough and studied the contamination in every media at the site. The Remedial Action selected in 1990 and constructed installed a slurry wall around the site and installed a clay cap which extended into the wetlands to the east. As a result, EPA had to construct an artificial wetlands to replace the wetlands covered by the cap. The wetlands were studied and did not contain contaminants at levels of concern. The wetlands samples were taken from an area that had the highest probability of containing site contaminants because it received surface runoff from the site. EPA concludes that there are no unsafe contact risks from contaminants to the east of the site.

The ground water to the east of the site and in the overburden was also studied during the remedial investigations conducted during the 1980s. These investigations analyzed ground water samples for the EPA target list of contaminants, including metals. Metals migration in ground water was not significant during these investigations, and EPA is not surprised by this fact. For example, even at highly contaminated lead sites, EPA often does not find significant lead contamination in ground water, unless the pH of the ground water is unusually low. The ground water at the Osborne Landfill is basic or neutral at the site. Disposal at the Osborne Landfill ceased almost twenty years ago, and EPA would not expect the site geochemistry to change significantly.

During the Remedial Investigation completed in 1995, nine wells were sampled for contaminants detected in the Homewood Aquifer during the extensive 1980s investigations (VOCs, pentachlorophenol, bis-(2-ethylhexyl)phthalate, lead and mercury). Additionally, EPA placed six wells in the shallow aquifer on the perimeter of the slurry wall. These wells monitor for water levels and contaminant breakthroughs and are analyzed for metals. These wells have shown only sporadic detections of low levels of contaminants.

It is true that the remedial action which has been constructed and which addresses soil and fill contamination is based on the investigations eight years ago. The cap covers the contaminated areas which contained significant metals contamination. In 1989, EPA issued a Proposed Plan, conducted a public meeting, accepted public comments on the Remedial Investigation, Risk Assessment and Feasibility Study. At the end of the comment period, EPA addressed comments regarding the surface soil and fill at the Osborne Landfill. At this meeting, many if not most of the attendees expressed an opinion that the Osborne Landfill was not a risk to the public and that EPA was wasting money investigating and cleaning up the site. Regardless of the opinions expressed at this meeting, EPA selected a protective remedy based on policy and science. EPA is not accepting additional comments on this remedy or the investigations leading to the remedy. EPA does not plan to conduct any further soil investigations for metals or any other contaminants.

It is untrue as explained above that the ground water decision is based on data that is eight years old. The supplementary Remedial Investigation fieldwork was completed in 1994 and the final Remedial Investigation Report approved in January 1996. The more recent data supplemented the extensive data generated during the 1980's, which defined the geology and ground water flow patterns, and identified the contaminants of concern in ground water. A regrettable lag occurred after the RI because of limited resources and higher priority work on sites with higher risk levels. The Site investigations had revealed that risks to the public from ground water were low and most of the nearby residents were using the public water line installed by Cooper Industries. Nearby residents had been tested and except for the Eickman well the wells were "clean". Therefore, EPA's efforts concentrated on completing the construction of the primary remedy which was of greater benefit to the public. The greatest realistic risk to the public was posed by children or adolescents coming in direct contact with the fill and this risk has been eliminated by the completion of the cap.

In 1989, EPA did not ignore the significant site risks even though the public sentiment appeared to be for No Action or minimal action. Conversely, in 1997, EPA cannot justify the extensive resampling and expanded investigation of issues already adequately addressed. In summary, EPA has not ignored metals issues, it has thoroughly investigated the site and issued an appropriate and protective Record of Decision in 1990. The ground water sampling program selected in this Record of Decision, in conjunction with the ground water performance sampling required by the first operable unit, will adequately protect the public.

2) Comment: EPA has failed to explain why the Kring well and pond, which EPA claims is fed from the same mine water as the Eickmann well only a few hundred feet away is one of the dirtiest. Understanding this relationship is critical to defining the extent, direction of flow and content of the offsite contamination. Without understanding the hydrologic conditions in the mine pool, EPA is unable to begin protecting the public health. EPA reported that the water source for both sites is the mine pool and I believe you attribute the chemical difference to "preferential flow paths" which EPA has not defined. Since this "preferential flow path theory" was first postulated (without scientific support) it has become gospel. I have reviewed all the data in the report from which this quote is taken and found no substantiating evidence cited. In fact, it is clear that this was the researchers guess at what was happening. What was presented as a guess becomes fact without research confirmation.

Response: The preferential flow of water and contaminants in the mine void system has been demonstrated by the chemical data collected and pump test results, and is consistent with the type of mining that occurred in the vicinity of the Site. Understanding of the data used to support the presence of preferential flow paths explains how locations "only a few hundred feet" apart can have very different water quality values.

The Brookville Coal beneath the area in question was deep mined at an undetermined time before 1940. The presence of flooded deep mine voids was confirmed by boring logs. Although detailed mine maps are not available, mining was presumably performed by the room and pillar method which was typical for the region. In this method, large haulage ways are cut, then rooms are cut into the remainder of the mine. Pillars of coal are left in place to support the overlying rock mass. As mining progresses, entries into exhausted areas may be blocked off to promote air circulation to the active face. In addition, retreat mining was often performed; in this practice, coal was removed from the pillars and the mine roof ultimately collapsed. After cessation of mining activities, further roof collapse would be expected.

The labyrinth of tunnels clearly does not conduct ground water in the same manner as a porous medium of bedrock mass. Water will move freely through long open haulage ways. However stagnant conditions may occur in isolated rooms, or in collapsed or blocked tunnels. The historic flow dynamics were further complicated by the interaction between the onsite ponds, which occupied the cropline of the coal and collected runoff fro storm events. The increased water level in the ponds following storm events forced water into the mine voids, creating a reversal of water flow in the mine voids during such events.

The lack of interaction between various portions of the mine void was demonstrated by CECs pump test, described in Alternatives Analysis for Design Modification, Operable Unit 4, (1993). During this test, water quality in the pumping well showed clear geochemical evidence of the influx of water from the mine void. However, a tracer injected into the mine void at a well less than five feet away was never detected in the pumping well.

The existence of preferential flow paths is clearly a natural consequence of deep mining beneath the site and is not conjecture, even though a direct link to the Eickmann well from the site has not been proven. Mapping of the mine openings and channels at the site and surrounding is technically infeasible because it would require the drilling hundreds or more borings, which still would not likely provide the sufficient data on the interconnection of all voids. EPA has placed enough wells to establish the rough extent of the plume. More importantly, EPA's sampling has established a band of clean wells to the east of the plume which defines the extent of contamination.

3) Comment: In addition to the uncertaintly related to the well void system, your expert stated that reliablility problems exist with the minimal sampling EPA has conducted. Apparently, the sampling in several wells under study was not completed under consistent conditions. Your expert identified this problem at the public meeting, as being the primary cause of the reduction in VOL material in the Eickmann well over the course of the study. Your sampling of this eastern area needs to be redone with constant conditions set for each sample site so that the data can be compared scientifically.

Response: The sampling efforts conducted around the site since 1986 have been substantial. Many of the domestic wells were only sampled once during a very extensive sampling effort. Most of these wells were not resampled because they were clean and the extent of contamination was adequately defined. Sampling of the Eickmann well has continued even though this well is no longer active. Even though the removal of this well from active use constitutes a change in conditions, this change is likely significant in terms of water quality. A typical domestic well withdraws only a couple of hundred gallons per day of water and does not develop a substantial capture zone. Termination of its use has not had a substantial impact on the hydrogeologic regime in this area.

4) Comment: I am deeply concerned that EPA presented a chart on the Eickmann well contamination that made the public think your cleanup is working. While in fact, subsequent questioning revealed that later samples, those showing low contaminants were taken under significantly different conditions than the early samples. In addition, your consultant admitted that these low readings were the result of the Eickmann well not being pumped regularly as it was prior to the latest sampling. Lastly, the Eickmann well chart presented to the public did not present a data point taken during May 1995 (11 ppb) which showed an upward trend.

Response: The commentor inaccurately characterizes the CEC consultant's remarks by using the term "admitted" which implies that EPA and Cooper Industries were trying to conceal the fact that the Eickmann well was no longer used. In fact, Cooper's consultant freely offered this information at the public meeting. The CEC consultant explained that part of the decrease may be due to the fact that the well has been shut down and that the well <u>might</u> have been drawing contamination to the well from the voids when it was used. The commentor suggested installing a new well in the mine void at this location. A mine void monitoring well was previously placed about 100 yards northeast from the Eickmann well and has not shown contamination. EPA and Cooper Industries try not to cause unwarranted problems for residents. Well locations are limited to locations where EPA can obtain permission to place monitoring wells, unless some compelling reason exists for a particular placement. EPA did not compell the Eickmanns to allow the installation of a void monitoring well on their property. The chart showing the Eickann well data should have contained the May 1997 data point. This issue is discussed in more detail above in EPA's response to Ms. Cleary.

5) Comment: EPA was fond of hedging its answers and referring the commentor to other reports and information.

Response: The commentor states on page 1, paragraph 3 of his comments: "After reviewing the reams of data...". The data he reviewed was only a small portion of all of the site related data available in the EPA office. In the face of this massive amount of information, it is unrealistic to expect EPA representatives to recall exact facts regarding information that had been gathered over the last ten years. This commentor also unrealistically demanded absolute answers, although good environmental science can only give probabilities. When asked for absolute answers, a scientist or engineer should qualify their answers even if the data are strong enough to support a decision. The purpose of the public meeting is to give the public a summary of the information, to answer general questions about the site and EPA's preferences and to direct the public to the administrative record for detailed information. Highly detailed technical questions are more appropriately answered in the Responsiveness Summary, so that accurate responses can be supplied rather that relying on memory.

6) Comment: During the meeting you presented inaccurate cross-sectional information which did not match the diagrams you have previously published in your Proposed Plan or for the NUS report of 1989. The consultant that presented these erroneous diagrams admitted his error when I questioned the diagrams accuracy at the meeting. I have since referred to the original work prepared by NUS in 1988 and 1989 and I found further discrepancies between your cross sections as presented in the meeting, the version published on page 7 of EPA's Proposed Plan of August 1997 and the NUS report figure 3.5.

In the NUS report, cross-section locations are shown on page 43 of volume 1. Review of these sections reveals that they are hedge diagrams not cross sections. The are however, drawn and presented as cross-sections on several pages following page 43. This creates an inaccurate representation of things such as dip, strike and ground water flow. These sections need to be redrawn and all conclusions made from them revisited. An example of this problem is presented in section A.

Response: Apparently, the author is expressing concern over the bends in the cross sections presented. Although cross sections for regional studies are typically straight lines oriented along strike or along dip, sections prepared for detailed, site-specific studies based on boring logs are commonly bent so that the sections can pass directly through boring locations. This is the standard practice in industry, and is done for the increased level of accuracy and adherence to actual data collected. Conclusions concerning strike,dip and ground water flow direction are not drawn from these cross sections, but rather from the full three dimensional database for the site. The sections are presented to display the data, not to facilitate quantitative data analysis. Since the section lines are clearly shown in the report, there should be no misconceptions about the meanings of these sections. EPA's technical reviewers have had no problems interpreting these drawings and EPA does not plan to revise these drawing or revisit past conclusions because of this comment.

The cross section presented as Figure 2 of the August 1997 EPA fact sheet is clearly generalized and simplified to be understandable to the general public. The general nature of the drawing is emphasized by the lack of section-location map, absence of any specific boring logs on the section, and lack of a horizontal scale. This figure was never intended to be a detailed technical drawing for data analysis purposes, but is rather intended to illustrated the relative position of the features of interest.

7) **Comment:** Cross-section B (hedge Diagram B) is nearly a straight line or true cross section of the site. Line D is also nearly straight so it is close to being a cross-section. These two lines are more accurate in displaying the site conditions than is line A.

By using "Cross-section B" presented on page 45 of their report and comparing it to the cross-sections you have published for public consumption, we can see in you August report and your public meeting cross-sections are misleading in the following ways:

A. Foundry sand, one of the principal potential contaminants identified at the site, is shown in NUS section B-B' as being in direct contact with the Clarion sandstones at LW-3 and it is shown penetrating the Clarion Unit just west of LW-3. This is significant since your ground water P-surface is located at an elevation 1286' in hole LW-3 and the coal is at elevation 1260' feet. This places the Brookville coal and mine voids below the Clarion/Contaminant interface in cross-section B-B. Geologicly there is no aquitard located between the Clarion sandstone and the foundry sand or between the sandstone and the contaminated water sitting in the old strip pit. Additionally, the mine void is shown as underlying the foundry sand in an area west of LW-3 extending nearly to well MWH-4. Here again no seal exists to prevent water from entering the mine. This is significantly different that the situation presented in the drawings presented to the public at last weeks meeting or in the

August Proposed Plan documents.

B. Subsidence was found to be causing the intermingling of waters in the mine void and the Clarion Sandstone in some areas of the site. It is therefore important to realize that the underlying voids may present a leakage threat to your containment vessel's integrity. Your vessel can only work if the mine voids and all sandstones are sealed by the Brookville fire clay and if they are isolated from the world by the constructed walls. It is not clear that this can be done at this site due to the lack of sealing clay and mine subsidence issues.

C. Other sections of the NUS report detail this interelationship, so it is reasonable to conclude that the Clarion is hydrologically linked to the mine void under the foundry sand deposited at this site. This causes a potential problem for your grout wall containment system since to be effective in preventing leakage it must seal and isolate the contaminants from the Clarion sand and the mine works at a depth of 50 or more feet. In addition, the grout wall will only work if the underclay is intact under the entire area being contained. Was this sealing accomplished and are as built drawings available? Did you confirm this sealing in any way?

D. The NUS report on page 48 states that it is uncertain that the underclay is continuous under the strip mine area. Further it identifies the clay as ranging from 0.01 thick to nine feet thick in test borings made at the site. At the public meeting, your consultant admitted that the Brookville underclay was not continuous across the site. If this is the case, your containment plan is doomed to failure when you terminate pumping of the contained area.

Response: As explained previously, the slide "cross-section" was just a simplified site depiction to show the locations of the site features.

A. EPA was fully aware that waste was in communication with the mine voids when the Record of Decision was issued. EPA was also fully aware of the complexities of cleaning up a site in communication with a mine pool. At some sites involving mined areas, the presence of mines has been the basis for a waiver of cleanup standards because of the difficulty addressing contamination in mines. As explained in EPA's response to Ms. Donan above, EPA convened a panel of slurry wall experts to review this proposal. Additionally, the U.S. Army Corps (USACE)of Engineers assign specialists in each are to review and comment on all aspects and stages of the Remedial Design. To assure that a quality installation was performed at this difficult site, EPA required virtually full time supervision by the U.S. Army Corps of Engineers for all critical parts of the project, including the bulkheading of the mine system. The USACE had their own trailer at the site and was responsible for verifying that the design was followed and the remedy properly constructed.

B. and C. The mine voids were sealed on the eastern side of the site by injection grout. At one point during the design, the USACE raised the potential for subsidence to damage the wall. In response to this concern, the bulkhead was made wider to protect the wall from the influence of subsidence. The slurry wall was then constructed through the grouted bulkhead. Calculations performed by Civil and Environmental Consultants showed that subsidence adjacent to the bulkhead would not harm the wall and these calculations were reviewed and approved by the USACE. If the bulkhead had not sealed the mine system, slurry would have quickly drained from the slurry trench during installation along the east side of the containment. The slurry wall was installed around the entire perimeter of the waste encompassing the fill, including the foundry sand at location LW-3, substantially restricting communication between the waste inside the containment and the Clarion aquifer/mine voids outside of the slurry wall.

During the Remedial Action "kickoff" meeting held in Grove City in 1995, several individuals asked if the township officials had the remedial design. At that time, the remedial design had not been requested or supplied to the township officials. The entire Remedial Design was given to the Township following the meeting and is available for review. The design has not been placed in the administrative record. The remedial design is not normally placed in the administrative record or the site repository. If citizens request it, and if the library will accept it, a copy could be added. The "As Built" drawings are part of a Remedial Action Report that is currently under review by the USACE.

D. EPA issued the Record of Decision for the slurry wall containment with full recognition that clay might be missing from some areas of the containment. In fact, it was one of the primary reasons that extraction wells were installed inside the containment. The purpose of the extraction wells is to lower the water level inside the containment below the levels in the adjacent aquifers, so that if a part of the containment isn't restricting flow, the water will leak into the containment instead of leaking out. If the system has large leaks, Cooper Industries would just need to treat more water raising the costs of their remedial action. The treated water is then reinjected into the mine system. This was a strong incentive for Cooper Industries to maintain quality during construction.

Missing clay will not "doom" the remedial action to failure. Prior to the Record of Decision, EPA actually considered placing a soil cover over the site instead of an impermeable cap. Water leaching or leaking into the containment will flush contaminants from the fill more rapidly and these will be collected by the extraction wells and treated. As long as an inward gradient is maintained, contaminants will not leave the containment. The extraction wells will not be shut off until the fill presents no threat to ground water. The cap, slurry wall and soil cover will substantially reduce leaching even after the extraction wells have been closed.

8) Comment: I believe the drawing on page 7 of your August report is misleading to the public and inaccurate. I request that new drawings be prepared for public review and that the inadequacies of NUS fence diagrams be fixed to conform to industry standards for cross sections.

Response: EPA has previously explained that the drawing on page 7 was a simplified illustration to show site features. Additionally, EPA has already explained why no modifications of the figures are needed.

9) Comment: At the meeting, I asked which way the ground water would flow from the site, and you indicated that it would flow toward the southeast at a bearing of around 160 degrees. This conforms with the drawings presented in the NUS report. However, closer inspection of the NUS report does not reveal springs or resurgence large enough to account for 23 gallons per minute of injected water let alone natural ground water flow. Could you locate on a map the exact location where all ground water within 1/4 mile of the site emerges and provide evidence for this data.

Response: The presence of springs is not an indication of the direction of ground water flow. Springs can occur when the water table intersects the ground surface, allowing ground water to discharge. However, ground water discharge can also occur as base flow to surface water bodies, diffuse discharge to wet areas, and evapotranspiration. The wetlands adjoining the site and Swamp Run are important ground water discharge areas. The relatively small amount of water will enter the normal ground water flow system of the extensive mine pool without causing significant changes to flow direction or rate.

10 Comment: In reviewing your ground water maps I noted that the Overburden Potentiometric Map presented on page 56 of the NUS report utilizes the elevation of the surface pond or glacial lake as the ground water elevation in the northwest end of the study area. It also seems to use the surface elevation as opposed to actual ground water elevations in making this map. Is it your intent to claim that this map represents the ground water P surface at this site? This seems to be an incorrect use of the hydrologic data. In referring to drill hole data, I find ground water was encountered at elevations more consistent with the mine void elevation throughout the spoil and glacial till.

Response: Page 3-9 on page 57 of the NUS report depicts the potentiometric surface based on monitoring points completed in the overburden. In that case, the potentiometric surface is the water table. The water table in the pond is included because the pond represents a ground water exposure in direct hydraulic communication with the overburden. In humid areas, such as the eastern United States, surface water bodies are usually exposures of the water table and are therefore used to augment well data on water table-maps.

The tendency for water-table contour lines to mimic topographic contours is also common for the eastern United States. Examination of the values associated with these contour lines shows they represent values which are 15 to 20 feet below grade. Clearly these lines are not surface-elevation contours.

It is unclear which test data was reviewed, but water levels from uncased boreholes are not appropriate for construction of potentiometric-surface maps. Monitoring wells are designed to determine conditions in vertically isolated intervals, while test borings measure water level which is a permeability-weighted average head along the length of the borehole. When the borehole encounters a mine void (a unit of virtually infinite permeability), the water level will be the hydraulic head in the mine void, and will not represent the position of the water table or the hydraulic head in any of the overlying strata. Section 4.1 of the <u>Alternatives Analysis for Design Modification, Operable Unit 4</u> discusses the vertical gradient between the Clarion sandstone and the underlying mine void, and indicates that the area east of the site is dominated by downward vertical gradients. That means the water table occurs at a higher elevation than the potentiometric surface on the mine void.

11) Comment: In addition, well MB1, located west of the strip mine spoil pile found ground water at 1245 feet. This elevation is consistent with the 14 feet per mile stratigraphic dip (0.15

degree) to the southwest identified on page 39 of the NUS report. Page 59 of the NUS report seems to indicate that ground water flow is to the southwest into the spoil area. Further, 8 gpm are indicated as escaping into the spoil overburden in one of the studies. It is also clear that discharge of the water from the dump occurred into the swamp southwest of the site and that it carried contaminants with it. I see no effort on EPA's part to define the spread of heavy metals in the till in this area.

My question is if the dip is to the southwest from the site and the contaminated soils were found southwest of the site why was so little effort made to delineate any metal contamination areas west of the site? Further please address the obvious inconsistencies in your ground water flow statements and geologic data collected in drilling.

Response: Your comment states "contaminated soils were found southwest of the site". We assume you are referring to the presence of black foundry sand found in sediments southwest of the site. Laboratory analysis of sediment samples collected detected Aroclor 1254 (less than 1 ppm which is EPA's cleanup level) and polynuclear aromatic hydrocarbons (PAH). Analysis of surface water samples did not detect any contamination. The focused remedial investigation of the wetland included a bioassay and bioaccumulation study. The bioassay concluded site contaminants using interstitial water obtained from the sediments have not measurably impacted the wetland. The bioaccumulation study concluded that Aroclor 1254 is not measurably affecting/accumulating in the wetland food chain.

There are no inconsistencies between the interpretation of ground water flow and geologic data. Although it is a common misconception that ground water flow must parallel dip direction, this is untrue. Ground water flows from areas of recharge to discharge. In shallow aquifers, this pattern most resembles surface drainage in a subdued fashion. The upland area west of the site prevents ground water from flowing further to the west. During the 1988 Remedial Investigation, EPA had wells placed in the overburden to the west of the site and did not see significant metals migration from the site. The pathway of concern for metals migration to the west of the site was surface water runoff not ground water flow.

EPA did test sediments for chemical contamination in the wetland that received the most runoff from the site for chemicals and for biological effects. The results showed no significant impact on the wetland. The wetland area most likely to receive contaminants from runoff is now under the cap system. Additionally, the spoil areas to west of the site were regraded for the landfill and most of those soils are now under the cap system. Much of the area west of the site was regraded and the elevation lowered to create the replacement wetlands. Excess soil was also placed under the cap. This wetland area has been seeded and a healthy vegetated cover established limiting soil contact. Additionally, EPA would like to point out that while the onsite soils were contaminated enough to require action, the average risk from systemic and carcinogenic effects in <u>onsite</u> soils was actually below EPA's action levels. The worst case systemic effects and carcinogenic effects did far exceed EPA's action levels, but the samples with this high risk were from subsurface boring samples.

In summary, it is extremely unlikely that runoff could raise contaminant levels to the west of the site above EPA's action levels. This obvious conclusion is supported by EPA's sampling results during the most recent investigation.

12) Comment: EPA used the term preferential flow path to explain the Eickmann well. Research on this statement took me to page 5 of the NUS report where the author speculated with out foundation about preferential flow paths. He did not present data to substantiate this theory. Would you please do this since it is a critical part of your hydrogeologic interpolation for the site. As you recall, I asked you at the meeting to define how you determined preferential flow paths existed under the Eickmann well. Please do this for me using scientific data.

Thirdly if preferential ground water flow paths, are carrying concentrated or higher levels of contaminants, and if they exist under the field east of the site, would it not be critical to identify all such paths with drilling prior to declaring the site clean?

Also please define how your injection of 23 gpm of treated water will affect the waters in these flow paths. What are the expected migration rates and what is the expected flow path of mine waters during injection. Won't these contaminated waters be forced further along their preferential flow paths by the water you are injecting? Won't this in effect move the plume outward into uncontaminated areas and outside of the sampled areas?

Response: A great deal of investigation has taken place since preparation of the NUS Report in 1989. The current understanding of ground water flow is discussed in Alternatives Analysis. As discussed earlier, the preferred flow pathways are related to the layout and condition of abandoned mine workings. The existence of these workings has been confirmed by drilling, and the general pattern can be inferred from the history of mining in Western Pennsylvania. However, no comprehensive accurate maps of these workings are available, and even if maps could be reviewed, they would not provide accurate information on the current condition of the mine voids. Drilling data could be acquired, but this effort could require hundreds or more boreholes and would indicate only the locations of open voids. This would furnish little information about the interconnection between one location and another. The detailed scientific data which the author requests cannot be acquired.

However, it is clear that-- whatever preferential paths exist -- they can only carry water downgradient. The hydraulic gradient in the mine voids is to the southwest. The injection of 20 gpm of water into a unit of nearly infinite conductivity will not raise the potentiometric surface enough to change the ground water flow direction. Injection, therefore, does not affect the pattern of ground water flow and does not cause the movement of contaminants against the natural direction of flow. Historic eastward components of flow were related to stormwater accumulation in the on-site ponds. These have been removed and stormwater has been routed to a stream, so the potential for such flow reversals in the future has been mitigated.

13)Comment: You appear to have failed to design a plan which could track the migration of contaminants eastward out of your study area during the injection of water into the mine pool. Is it your theory that as long as the wells test clean that the site is clean? Have you prepared a plan to deal with contaminated mine waters being forced from the site to undefined discharge points or to people's wells outside your monitoring area?

Response: As previously explained, ground water flow in the mine pool is toward the southeast. Pumping huge amounts of water in the mine void failed to show any decrease in water level in the mine void. Regional drainage is also to the southeast. EPA does not believe that the mine void flows will be substantially affected by the relatively small quantities (less than 9 gpm) at each well location. However, the water that is injected into the mine voids has been treated to below MCLs for contaminants. If hypothetically, the injected water moved the flow somewhat further east as it moves toward the southeast, the only resident not using public water and in the potential path of the Eickmann contamination is the Kring residence. EPA plans to sample this residence, and will also obtain additional water level data which EPA believes will verify that no easterly gradient has been created. EPA believes that the well network outlined in the Record of Decision is adequate to monitor the plume from the site.

14) Comment: Conclusions - This project and its reports are fraught with technical errors and unsubstantiated assumptions. More work needs to be done before this ROD and cleanup project are completed. Geologic and hydrologic data need to be gathered west of the Glacial Till and east of the site beyond the limits of the current study. Further the final discharge point for all affected mine waters should be located and sampled during treatment. Dye tracing with Rodimine dye may help in defining flow paths underground.

Response: EPA believes that the above comment is both inaccurate and is contradicted by the existing record. EPA's previous responses address the comments which lead the reviewer to the above conclusion. Three investigations have produced data which is fully adequate to support the Natural Attenuation Record of Decision for Site ground water. The presence of the water line and the monitoring program, in conjunction with the source control remedial action from the first record of decision provide substantial protection to the public. EPA gathered substantial and sufficient information about the ground water in the glacial till to the west of the site during the 1989 Remedial Investigation. As explained previously, EPA does not believe that dye tracing would be effective or that it is needed in this Site setting. Also explained previously, the ultimate discharge point does not need to be located and might be impossible to define if ground water travels for miles before discharging. However the ultimate discharge point is to regional drainage to the south as described in the first Remedial Investigation completed by Cooper Industries.